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REDAKSIONEEL · EDITORIAL

ADRENALE AMIENE

'n Amien wat ten nouste aan die adrenale hormoon, norepinefrien, verwant is, is nou vir die eerste keer in menslike weefsels gevind deur navorsingswerkers by die National Heart Institute, in Bethesda, Maryland.* Die nuwe amien, 3-metoksi-norepinefrien, is van basiese belang omdat dit afgelei word van norepinefrien, en omdat dit 'n rol kan speel in die normale metabolisme van hierdie fisiologies belangrike amien by die mens.

Dr. Albert Sjoerdsma en William King, van die Laboratory of General Medicine and Experimental Therapeutics, en dr. Sidney Udenfriend en Lemuel Leeper, van die Laboratory of Clinical Biochemistry, het die nuwe amien gevind in norepinefrien-produiserende byniergewasse (phaeochromocytomata) wat verwyder is uit pasiënte met drukverhoging wat die gevolg van gewasse was.

Norepinefrien (en sy voorlopers en derivate) is van besondere belang vir die Heart Institute nie alleen weens die bekende stimulerende effek wat dit op die hart en die bloeddruk het nie, maar ook omdat bevindings by die Heart Institute aangetoon het dat brein-norepinefrien, tesame met 'n ander amien (serotonien) in die brein betrokke is by die sentrale regulering van die twee afdelings (simpaties en parasimpaties) van die outonome senuweestelsel. Dit wil dus voorkom asof 'outomatiese' funksies soos bloed-

ADRENAL AMINES

An amine closely related to the adrenal hormone norepinephrine, has been found in human tissues for the first time by investigators at the National Heart Institute in Bethesda, Maryland.* The new amine, 3-methoxy norepinephrine, is of basic interest because it is derived from norepinephrine and may play a role in the normal metabolism of this physiologically important amine in man.

Dr. Albert Sjoerdsma and William King, of the Laboratory of General Medicine and Experimental Therapeutics, and Dr. Sidney Udenfriend and Lemuel Leeper, of the Laboratory of Clinical Biochemistry, found the new amine in norepinephrine-producing adrenal tumours (phaeochromocytomata) removed from patients with hypertension which had resulted from the tumours.

Norepinephrine (and its precursors and derivatives) is of particular interest to the Heart Institute, not only in connexion with its well-known stimulating effects on the heart and blood pressure, but also because Heart Institute findings have implicated brain norepinephrine, together with another amine (serotonin) in the brain, in the central regulation of the two divisions (sympathetic and parasympathetic) of the autonomic nervous system. Thus 'automatic' functions such as blood pressure, heart rate and emotional states

* Die National Heart Institute is een van die 7 Nasionale Gesondheidsinstitute waaruit die navorsingsafdeling van die Amerikaanse Openbare Gesondheidsdiens saamgestel is. In die Verenigde State bestaan hierdie Diens uit die Departement van Gesondheid, Opvoeding en Welsyn.

* The National Heart Institute is one of the 7 National Institutes of Health that comprise the research arm of the Public Health Service, which is in the U.S. Department of Health, Education and Welfare.

druk, die tempo van die hartslae en emosionele toestande gereguleer word deur die vrystelling in die brein van die twee amiene, norepinefrien en serotonien.

Tydens hul studies in verband met die metabolisme en funksies van hierdie amiene het dr. Sjoerdsma en dr. Udenfriend belang begin stel in die 3-metoksi-derivaat, toe navorsingswerkers by die Universiteit van Utah† 'n 3-metoksi-eindproduk van norepinefrienmetabolisme gevind het in die urien van pasiënte wat norepinefrieninspuitings ontvang het om hul dalende bloeddruk te stuit. Later het dr. Julius Axelrod, ook van die National Institute of Health, in rotlewer ensieme gevind wat die vermoë besit het om norepinefrien in 3-metoksi-epinefrien te verander‡. Hierdie ontdekkings het navorsingswerkers by die Heart Institute aangemoedig om na die 3-metoksi-derivaat in menslike weefsels te soek. Hulle het 3-metoksi-norepinefrien sowel as die gewone groot hoeveelheid van die moederamien, norepinefrien, in byniërgewasse ontdek.

Hul studies met hierdie amiene word voortgesit met die doel om vas te stel watter rol hulle in die liggaam speel, veral vir sover dit beheer oor die bloeddruk en die hartfunksies betref.

appear to be regulated by release in the brain of the two amines, norepinephrine and serotonin.

During their studies of the metabolism and functions of these amines, Drs. Sjoerdsma and Udenfriend became interested in the 3-methoxy derivative when investigators at the University of Utah† reported a 3-methoxy end product of norepinephrine metabolism in the urine of patients receiving norepinephrine injections to support failing blood pressure. Dr. Julius Axelrod, also of the National Institutes of Health, subsequently found, in rat liver, enzymes that converted norepinephrine to 3-methoxy epinephrine‡. These discoveries prompted the Heart Institute investigators to look for the 3-methoxy derivative in human tissues. They found 3-methoxy norepinephrine, as well as the usual large quantity of the parent amine, norepinephrine, in the adrenal gland tumours.

Their continuing studies on these amines are aimed at learning what role they may have in the body, especially what part they play in the control of blood pressure and heart function.

VOLVULUS OF THE STOMACH

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A REPORT OF TWO CASES

Volvulus of the stomach is a relatively rare condition. In 1866 Berti¹ published the first report of this condition. In 1930 Buchanan² found 34 cases, and in 1940 Gabor³ found 75 cases reported in the literature. Since 1940 a review of American and British literature revealed a further 25 cases. Schatski and Simeone⁴ and Hamilton,⁵ reviewing the cases, showed that many of them are not true volvuli, but merely reveal a high position of the stomach with rotation of the entire viscus, or an exaggerated form of transverse steerhorn type of stomach which shows various degrees of cascade effect.

† Die Utah-bevindings deur M. D. Armstrong, A. McMillan en K. N. F. Shaw is gepubliseer in *Biochemica and Biophysica Acta* (25:422, 1957).

‡ Dr. Axelrod se bevindings is gepubliseer in *Science* (126:400, 1957).

CASE REPORTS

CASE 1

Mr. F. H. P., an electrician, aged 47 years, helped to pick up an electric standard in 1954. From that moment he developed a tender spot across the abdomen. If he pressed against the side he could feel it. The tenderness wore off, but manifested itself again from time to time. Apart from this tender spot he felt fit, could eat well and eat everything.

In October 1955, he began to waken in the morning with a feeling of nausea and fullness, which became worse as the day wore on. He then vomited and this was so profuse that

† The Utah findings, by M. D. Armstrong, A. McMillan, and K. N. F. Shaw, appear in *Biochemica and Biophysica Acta* (25:422, 1957).

‡ Dr. Axelrod's findings are reported in *Science* (126:400, 1957).

he had to leave work and go home. After lying down for a while the condition improved.

On 5 November 1955 he developed a severe attack, the vomiting persisting all day and night. His doctor saw him on 6 November and found him severely dehydrated. He was admitted to a nursing home where, after Wagensteen drainage and intravenous therapy, he made a complete recovery and was discharged.

After his discharge from the nursing home he had repeated attacks of vomiting every 6-7 days, so that, although he was hungry, he was terrified to eat lest it brought on an attack of vomiting.

Since the commencement of these attacks his bowels have become constipated and he has found that if he could clear his bowels he could avoid an attack.

His weight was satisfactory after his discharge from the nursing home.

Clinical Examination. No abnormality detected.

LABORATORY INVESTIGATIONS

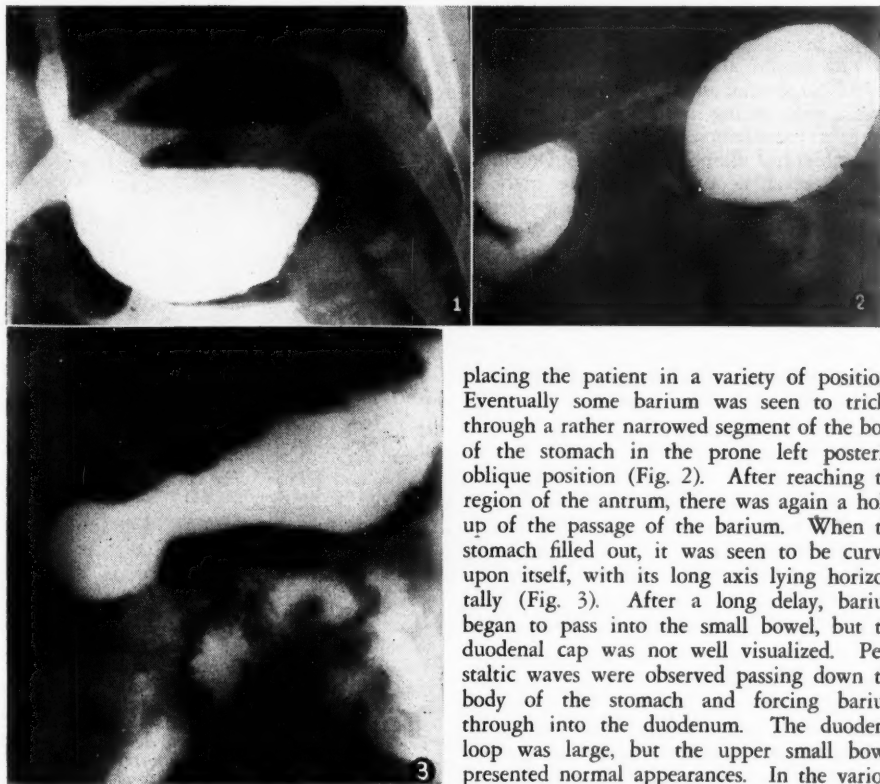
Haemoglobin: 16.7 g. %; Red Cell Count: 5.2 million per c.mm.; Leucocyte Count: 5,800 per c.mm.; Neutrophils: 70%; Monocytes: 1.5%; Lymphocytes: 41%; Eosinophils: 2%; Basophils: —

The red cells and the platelets are normal in appearance.

Blood Urea: 24 mg. per 100 ml. Serum Chlorides: 99 mEq. per litre. Serum Potassium: 4.4 mEq. per litre. Serum Sodium: 137 mEq. per litre. Plasma CO₂ Content: 22.6 mEq. per litre. Faerber, Friedman and Datt, who were responsible for the X-ray examinations.

X-ray Examination (17 November 1955).

Stomach: After the first few mouthfuls, the barium was seen to collect in what appeared to be the fundus of the stomach (Fig. 1). A large collection of fluid, surmounted by an air bubble, was seen above the barium. After having about a half a cup of barium, the patient could take no more due to a feeling of fullness in the epigastrium. Attempts to force the barium to flow into the remainder of the stomach were unsuccessful, in spite of



placing the patient in a variety of positions. Eventually some barium was seen to trickle through a rather narrowed segment of the body of the stomach in the prone left posterior oblique position (Fig. 2). After reaching the region of the antrum, there was again a hold-up of the passage of the barium. When the stomach filled out, it was seen to be curved upon itself, with its long axis lying horizontally (Fig. 3). After a long delay, barium began to pass into the small bowel, but the duodenal cap was not well visualized. Peristaltic waves were observed passing down the body of the stomach and forcing barium through into the duodenum. The duodenal loop was large, but the upper small bowel presented normal appearances. In the various

views of the stomach, fluid levels were seen, presumably within the large bowel.

Follow-Through X-Ray Film. About 2 hours after taking the barium there was still a large residue left in the stomach. The appearances confirmed a delay in the gastric-emptying time. The small bowel pattern that was demonstrated appeared normal.

CONCLUSIONS

1. There is a volvulus of the stomach which appears to be of the cardio-pyloric type.

2. There was a marked degree of hold-up of the barium which could only be coaxed into the remainder of the stomach with difficulty. When the barium did leave the distend fundal pole, the patient's symptoms of fullness were eased. The patient was able to finish the remainder of the cup of barium, but again complained of fullness before the barium began to flow into the duodenum, when again the symptoms were relieved.

3. The duodenal loop was rather large, due probably to the volvulus of the stomach.

4. There was no evidence of stretching of the duodenum.

5. Fluid levels were observed, presumably within the large bowel. Their significance was doubtful.

In view of the X-ray findings the patient was advised to undergo laparotomy, but he refused operation as he felt extremely well. For one month after the X-ray examination he had no further attacks of vomiting. His bowels were acting normally, there was no diarrhoea, constipation or pain, and he felt that his troubles had disappeared. On 19 December 1955, however, he suffered a severe attack of vomiting, which necessitated his further re-admission to the nursing home for Wangenstein drainage and intravenous therapy. He again made a very rapid recovery and then consented to operation.

Examination. On 24 December 1955, I saw the patient in consultation. On examination nothing abnormal was found on palpation of the abdomen, and the patient was advised to have a laparotomy to determine the cause of the volvulus of the stomach.

On 30 December the abdomen was opened through a mid-line incision. The pathology was immediately apparent. A carcinoma was seen occupying the middle portion of the transverse colon. This had caused marked puckering of the gastro-colic ligament, so that the colon was now lying anterior to the stomach and between the stomach and diaphragm. Ten inches of the transverse colon, together with the omentum and gastro-colic ligament, were removed, and an end-to-end anastomosis was performed. On the third post-operative day flatus was passed, and on the fifth day the patient had a bowel action.

Since the operation his bowels have acted regularly, his appetite has improved, and the patient has gained 40 lb. in weight. Two years after the operation the patient is fit and well.

Histological examination showed the presence of a tumour narrowing the lumen of the colon. Sections taken of this tumour showed the presence of a mucin-secreting adenocarcinoma, infiltrating through the muscularis to the serosa.

Sections taken of 3 small lymph glands adjoining the tumour showed the presence of reactive hyperplasia and sinus catarrh, but no evidence of infiltration by carcinoma.

CASE 2

Mrs. C. P. B., a housewife aged 49 years, stated that in 1954 she experienced a sensation of being 'blown' after each meal. This sensation was often accompanied by a dull ache in the upper abdomen which tended to radiate through to the back and to the left shoulder. Vomiting had occurred on a number of occasions, the vomitus being bile, and on no occasion was undigested material present in this vomitus. Although her appetite was very good, she had refrained from eating, as the first few mouthfuls made her feel full and 'blown'.

There was no loss of weight. Constipation was a marked feature from the onset of the symptoms.

Urinary History: Negative.

Menses: Normal.

The patient stated that she had been on pills which helped for a short time, but that now the condition was getting worse in that she could not eat without becoming distended. Bilioussness was a marked feature.

Examination:

She was of the obese type. Apart from some tenderness in the epigastrium, nothing was found on clinical examination.

She was referred for X-ray examination on 12 July 1958. The cholecystogram and the barium enema were normal. The result of the barium meal was as follows:—

"No lesion was noted in oesophagus. The stomach was seen to lie high up in close relationship to the left dome of the diaphragm, and at its pyloric end, in close relationship to the liver. Volvulus of the stomach on its cardio-pyloric axis was noted. No intrinsic lesion of the stomach was noticed and gastric mobility and motility were normal. No pylorospasm was encountered.

In accordance with deformities of this description, the duodenal ulceration was identified at this examination. The small intestine revealed no other significant feature.

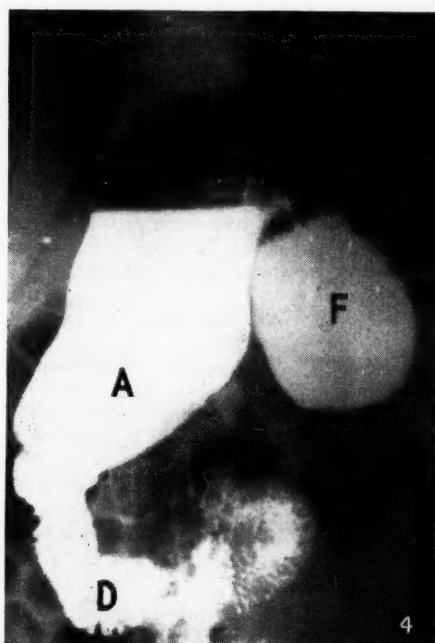


Fig. 4. Erect.

F: Fundus; A: Antrum; D: Duodenum.

Fig. 5. Supine.

Am: Ampulla; F: Fundus; A: Antrum; J: Jejunum.

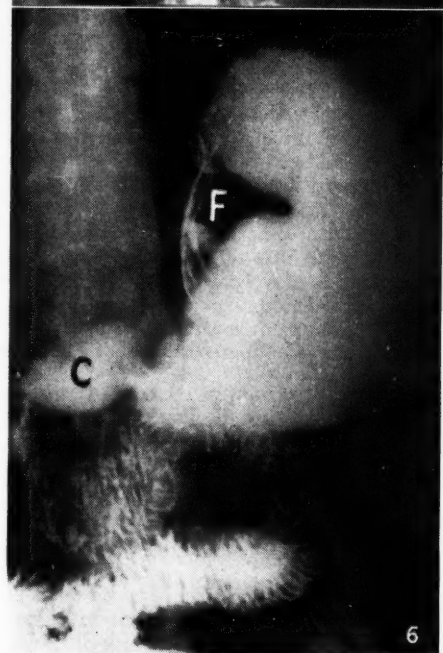


Fig. 6. Prone.

F: Fundus; C: Cap

Transit of barium through the small intestine was within normal limits. At 2 hours the stomach was almost completely void of barium and the small intestine was normally outlined.

CONCLUSIONS

1. There is no evidence of gall stones.
2. The gall bladder concentrates dye satisfactorily. There is thus no evidence of gross cholecystitis, but milder degrees of cholecystitis are not excluded.
3. No lesion was noted in the oesophagus. Transient dilatation of the phrenic ampulla was noted.
4. There was a volvulus of the stomach on its cardio-pyloric axis, the stomach tending to assume a bilocular appearance in the erect position (Fig. 4). No definite diverticulum of the stomach was noted. (Figs. 5 and 6 illustrate the supine and prone views of the volvulus.)
5. No other abnormality was observed in the stomach or duodenum, no ulceration being identified.
6. Transit of barium through the small intestine was normal.

In view of the X-ray findings, the case presented as a volvulus of the stomach of the idiopathic type, and the patient was therefore advised to undergo operation.

On 21 July 1958, a laparotomy was performed. The gastro-hepatic omentum was elongated, and the volvulus could easily be reduced, but recurred almost immediately. A subtotal gastrectomy was carried out.

DISCUSSION

Volvulus of the stomach can occur in an acute or a chronic form. It may occur at any age, but is usually seen in the middle-aged patient, mostly of the obese, hypersthenic type. Singleton in 1940 suggested a descriptive classification:

1. Axis of Rotation:

(a) *Organo-Axial*: Rotation occurring on relatively fixed parts of the oesophageal and duodenal opening.

(b) *Mesenterio-Axial*: Rotation in the axis of the mesenteric attachments of the stomach.

2. Degree of Rotation:

(a) Complete, if torsion is 180 degrees or more.

(b) Incomplete, if torsion is less than 180 degrees.

3. Direction:

Anterior or posterior.

4. Etiology:

(a) Idiopathic.

(b) Associated or contributory pathology.

PATHOLOGY

Volvulus means twisting of a portion of the intestine or other hollow viscus. Secondary changes consist of various degrees of dilatation of the stomach due to obstruction at the point of torsion, circulatory changes and oedema, with the stomach wall thickened to 2 cm. or more.

Associated Pathology. Peptic ulcer, hour-glass stomach, benign tumours or even carcinoma.

In some of the reported cases these were contributory factors in the production of the volvulus. The transverse colon or splenic flexure of the colon or both were found high in the abdomen, apparently pulled up by the gastro-colic omentum to a position anterior to the stomach, between the latter and the diaphragm.

ETIOLOGY

A definite etiological factor exists between the volvulus and associated pathology, which may not be definite.

Common factors are.

(a) Elongated gastro-hepatic omentum.

(b) Elongated gastro-colic omentum.

(c) Eventration of the diaphragm.

(d) Oesophageal hiatus hernia.

If one or more are found along with the volvulus, it seems likely that the volvulus occurred as a complication of the other pathology.

Only a few cases can be classified as idiopathic, and even in these it is doubtful whether the volvulus would have been produced unless there was elongation or some defect of the gastro-colic or gastro-hepatic ligament.

SYMPTOMATOLOGY

1. Intermittent attacks of acute-colicky, upper abdominal pain.

2. Fullness or distension of the upper abdomen.

3. Profuse vomiting.

4. A symptom-complex suggestive of peptic ulceration.

5. Loss of weight.

TREATMENT

Conservative: Wangensteen drainage with intravenous therapy to correct dehydration and electrolytic loss. This gives immediate and prompt relief, as seen on both occasions in this patient. However, the tendency for recurrence of attacks is always present.

Surgery: For the case which falls under the classification of idiopathic, sub-total gastrectomy is indicated. This is also so in cases of elongated gastro-hepatic or gastro-colic ligaments.

In all the cases the associated pathology must be dealt with.

Two cases of volvulus of the stomach are presented.

SUMMARY

Two cases of volvulus of the stomach are presented. In the first the underlying pathology was a carcinoma of the transverse colon.

The second case was of the idiopathic type, the common factor being an elongated gastro-hepatic omentum.

It is important to differentiate between true volvulus and simple rotation with a high position of the stomach.

OPINION

Twee gevalle van volvulus van die maag word beskryf. In die eerste geval was die onderliggende patologie 'n karsinoom in die dwars gedeelte van die dikderm.

Die tweede geval was idiopaties.

Dit is van belang om te onderskei tussen suiwer volvulus aan die een kant en eenvoudige draaiing met 'n hoë posisie van die maag aan die ander.

The author is indebted to Dr. I. Freed who referred Case 1; to Dr. H. Berghaus for Case 2, and to Drs. Faerber, Friedman and Datt, who were responsible for the X-ray examinations.

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FURTHER VIEWS ON THE SURGERY OF HYPOSPADIAS

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The treatment of hypospadias is far from standardized and there is still considerable difference of opinion both about the optimum time for surgical intervention and the type of surgery to be performed.

There is no standardized operation for the treatment of hypospadias and varying techniques for the cure of the condition have been put forward by both urologists and plastic surgeons. The historical development of the various surgical procedures makes interesting reading and would require many pages of close knit print and diagrams.

Since the publication of my previous article on hypospadias,¹ various modifications in technique have led to improved end-results.

Terminal hypospadias distal to the coronal sulcus is rarely associated with chordee, and it seldom calls for surgical intervention. The presence of a pin-point external meatus will necessitate a meatotomy.

A forked stream or a spray of urine on micturition, is often due to a ridge or septum distal to the meatal opening and this is best corrected by deeply guttering, with the diathermy knife, the ventral surface of the glans from the external meatus to the tip of the penis.

The hooded prepuce sometimes leads to an odd appearance of the penis, and this is easily corrected with a modified circumcision. It is generally agreed, as with other congenital defects such as hare lip and cleft palate, that the condition should be rectified in early childhood.

The more severe types of hypospadias require to be repaired in 2 stages, viz. the correction of the chordee and, later, the construction of the missing urethra. The repair of the chordee is of paramount importance, first, to permit normal growth and development of the penis, which is otherwise impeded;

and second to permit normal sexual relations in adult life. This repair is best undertaken between the age of 12-18 months. Lesser degrees of curvature can be satisfactorily rectified by the Mikulicz procedure in which all fibrous bands are divided or excised by a transverse incision, which is then closed longitudinally. More advanced degrees of chordee are best handled by the Howard-Mays operation,² in which a large preputial flap is fashioned to cover the denuded ventral surface, from which all fibrous bands have been excised. The operation is an excellent one which allows of considerable lengthening of the ventral surface of the penis and even enhances its girth somewhat.

Redundancy of the ventral skin flap, however, does eventually lead to excessive rugosity of the urethra, even to the point of prolapse, which hampers the stream of urine considerably. This undesirable condition is prevented by careful trimming of the preputial flap. If excess skin is still present when the second stage is performed, then this should be removed by excising a wedge of the urethral strip, after the Denis Brown flaps have been raised.

The second or final stage repair, which is performed at about the age of 6 years, requires careful pre-operative planning. Chloral hydrate is prescribed for several days after the operation, and antibiotic urinary antiseptics also assist in the better healing of the wound.

The operation of choice for the construction of the urethra is the Denis Brown procedure³ with certain modifications. I no longer perform perineal urethrotomy for the diversion of the urinary stream. Any leakage past the catheter often leads to repeated spasms with unnecessary discomfort and infection of the penile wound. Suprapubic cystotomy, through

a transverse incision, leaves no scar in the long run, is easy to perform and, effectively and with comfort, diverts the urinary stream away from the site of the plastic surgery.

Careful and delicate handling of the tissues is essential for satisfactory healing. Plastic surgery instruments should be used and the flaps should only be handled with Gillies hooks. Rough handling interferes with the blood supply of the flaps and with healing. Dissection of the flaps must be wide and include as much deep tissue as possible. This relieves tension, improves the circulation of the flaps and allows for the introduction of the type of deep tension sutures which I now employ exclusively. I no longer use the through-and-through Denis Brown tension sutures which, if drawn too tightly, interfere with the blood supply and often lead to fistula formation. Subcutaneous fine catgut sutures, which draw the flaps together and keep them there, so that no tension is placed on the skin sutures, have proved very satisfactory. If any of these deep sutures do cut out, no fistula results and the skin edge will have had an opportunity of uniting and healing. It is also reassuring to know that these stitches can be tightly drawn together, they are haemostatic and do not require to be removed (Figs. 1-4).

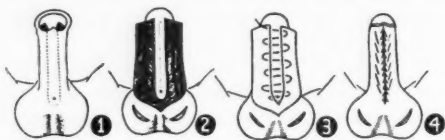


Fig. 1. Outline of strip of skin and area of glans to be excised.

Fig. 2. The lateral flaps are raised.

Fig. 3. This shows the subcutaneous tension sutures.

Fig. 4. The skin edges are now approximated.

In young children the skin edges are brought together with catgut stitches, but in adults I prefer to use fine silk or Deknatel. Dry dressings are lightly applied to the penis and these are removed after 24 hours. Occasionally an adherent dressing, if left on for a few days, pulls some of the stitches out when removed, leading to fistula formation.

The suprapubic tube is usually withdrawn on the seventh post-operative day, after which the wound rapidly closes and the patient passes urine normally. In children a size 20 or 22 two-way Foley catheter is used suprapubically with a 5 c.c. balloon, as this can be removed without any discomfort or pain to the patient.

The aforementioned procedures have given eminently satisfactory results in over 50 cases, with minimal complications; and the end results give both the patients and the surgeon considerable satisfaction.

OPSOMMING

1. Verdere menings oor die chirurgie van hipospadie word uitgespreek.

2. Dit is van die allergrootste belang om die cordée te korrigeer voordat die vermiste uretra gevestig word.

3. Die gewysigde tegniek vir die insteking van die spanningshegtings het die meeste verwikkelinge wat aanleiding tot die vorming van fistels gee, uitgeskakel, met die gevolg dat daar 'n aansienlike verbetering in die eindresultate is.

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MOBILE TRANSFUSION AID

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Rand Mines, Transvaal

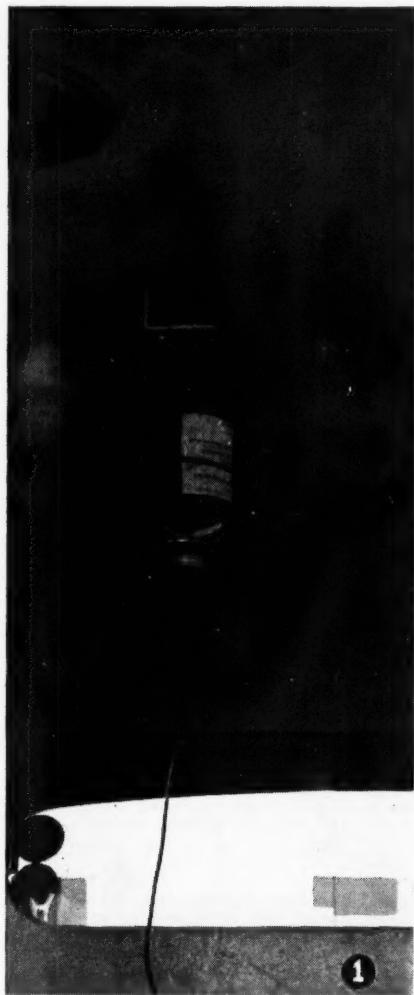
The most one can usually hope for in an ambulance is a hook on which to hang the infusion.

Those who have had to control swinging bottles whilst attempting to maintain cannulae in the arms of restless patients will appreciate the need for some such apparatus as is here described.

Any apparatus used must be readily detach-

able so as not to prove a hazard to the heads of ambulance passengers; and any fittings that remain must be flush with the roof of the ambulance and not protrude in any way.

We occasionally have to make a trip of some 180 miles from Harmony to Johannesburg with critically injured or ill patients. The apparatus described here (Fig. 1) has been used on such trips and proved adequate.



The roof plate is $4 \times 2\frac{1}{2}$ inches long and $\frac{1}{8}$ inch thick. The edges are rounded and it has 4 holes drilled in it. Two are threaded for the wing nuts and 2 are to enable it to be screwed flush against the roof of the ambulance at a selected site—usually central and nearer the front than the rear end.

The main plate is of $1 \times \frac{1}{8}$ inch mild steel flat bar, $13\frac{5}{8}$ inches long, bent at 90° 3 inches from the end. This short portion is drilled to freely accommodate 2 wing nuts which screw into threaded holes in the roof plate, allowing rapid fixation and removal.

Half an inch from the lower end of the main plate there is a split circle of $\frac{1}{4}$ inch copper rod that will embrace the neck of the bottle. It must not be a complete circle, otherwise one has to disconnect the tubing from the bottle when one slips it into the holder. Not only would this be awkward, but one would also lose the contents of the bottle.

Further up the main plate are hinged 2 strips of spring steel which can be rapidly fastened in front round the body of the bottle by a quick locking clamp of copper rod.

Different sizes of clamp are required for the different bottles (Dextran-Blood-Vacoliters), but all are readily attached to the roof plate and, when not in use, are kept in a cupboard in the ambulance.

I wish to thank Dr. A. M. Coetzee, Chief Medical Officer, Rand Mines, Limited, for permission to submit this paper for publication; also Mr. Backer, of the Harmony workshops, for making the prototype; and Mr. Hausman, of the Engineering Drawing Office, for the blueprints.

Through the courtesy of Mr. Thiel (Manager of the Harmony Gold Mining Company Limited), I am in a position to offer blueprints to colleagues and ambulance authorities who desire to duplicate this apparatus.

HEALING OF CUTANEOUS ABRASIONS AND OF INCISIONS

CLOSED WITH SUTURES OR PLASTIC ADHESIVE TAPE

A COMPARISON, WITH SPECIAL REFERENCE TO EPITHELIAL-CONNECTIVE TISSUE RELATIONS DURING REGENERATION, REPAIR AND IN NEOPLASIA

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The healing of cutaneous wounds, both 'incised' (i.e. without tissue loss) and 'excised' (i.e. with varying amounts of tissue loss), in man and in animals has been re-examined in

detail, and the findings, discussed in the light of the relevant literature have been presented elsewhere.^{5, 7, 8, 11-13} In summary, the main differences between the views usually described

in textbooks and widely accepted by most investigators, and those emerging from our own investigations, are:

1. Surgical incisions and partial-thickness loss 'excised' skin wounds (as exemplified in split-skin graft donor sites) are bridged *first* by epithelium and only later by connective tissue.

2. Epithelium invariably 'inverts' into the line of an incision, thus giving the wound, in microscopic section as well as clinically, a depressed V-shape.

3. Vigorous epithelial downgrowths into the dermis, in the line of incision, invariably occur between the 6th and 15th post-operative days.

4. As in the incision, so too at the sites of suture needle puncture wounds in the skin, epidermis always invades vigorously along the sutures and especially along the outer and deep aspects (relative to the incision). These latter epithelial reactions and the associated connective tissue changes, in response to both suture and associated epithelial downgrowth, were frequently as vigorous (if not more so), albeit more confined, than at the incisions themselves. Such invasions of epidermis into the dermis frequently complicate healing and aggravate the residual scars.

For the foregoing reasons alone, methods for wound closure, other than suturing, were considered desirable. One such method investigated, was the use of transparent adhesive plastic tape. The results of our findings with this method have been described and its advantages indicated elsewhere by us^{7, 10, 12} and by Williamson.²³

Among the fundamental points on wound healing which still require investigation is the question: what determines when wounds will heal by scar formation (i.e. repair), as opposed to reconstitution of the original architecture of the damaged area *without* residual scars, i.e. regeneration? It has previously been suggested that the *depth* and not the extent of an injury was the deciding factor.⁵ It still remains to be determined, with precision, whether morphological differences can be detected in injuries healing by regeneration as opposed to repair, and to define more accurately the factors which are operative in promoting the one or other mode of healing.

In view of the now wide-spread use of 'dermabrasion,' or 'skin-planing,' for the partial or complete removal of various types of scars, an analysis of the healing of such abraded areas, as compared with the healing of deeper injuries, was also considered to be desirable, especially in view of the practical importance of this procedure and the fact that no systematic analysis of the healing of dermabrasions has, to our knowledge, yet been provided.

The object of the present study is to report and to compare the healing of abrasions themselves and of incisions made either through abrasions or through the intact skin. Some of

the practical as well as the theoretical implications of the findings arising from this investigation will then also be discussed.

MATERIAL AND METHODS

Details of the surgical and histological techniques applied in this study have been provided elsewhere.^{10, 13} Briefly stated, duplicate sets of incisions, 1½–3 inches long (i.e. 4–6 incisions in each subject), extending down to subcutaneous fat, were made under local anaesthesia on the volar aspects of the forearms of 5 adult volunteers and closed with multiple silk sutures or with plastic adhesive tape such as Sellotape. A special pliable transparent polyvinyl tape, kindly supplied by the Minnesota Mining and Manufacturing Company, has been found ideal because its softness permits perfect moulding to the body contours.

Apart from indicating that the wounds were made on ambulant individuals, going about their daily duties, details relating to the dressings, antiseptic precautions, etc. are not relevant to the present discussion, and may be found in previous communications.^{10, 13} All wounds were examined at 5, 10, 15, 20, 40 and 60 days post-operatively, and were photographed on each of these occasions. At least 2, and in some instances 3, elliptical biopsies, 5–10 mm. long, 2–4 mm. wide, and down to subcutaneous fat, were taken on 2 or more of the aforementioned occasions, while the 'duplicate' set of control wounds, on the same forearm was allowed to heal without any further interference.

All biopsy specimens were gently stretched out on blotting paper, and were fixed in 10% formalin. Thereafter they were dehydrated through alcohol, embedded in wax, and 10–30 serial sections of each specimen were mounted on 3×1 inch slides, so that each slide, serially numbered, carried 2–4 sections. At least 4, and frequently 6 or 8 different stains or histochemical methods were applied to one or more of the slides in each series. Routinely, the following stains were used—haematoxylin and eosin, a modified Masson's method, Mallory's triple connective tissue stain, orcein and haematoxylin, and Mallory's phosphotungstic acid haematoxylin method. In addition, the following techniques were frequently used to acquire further data—Wilder's reticulin counterstained with van Gieson's picro-fuchsin, Verhoeff's elastic tissue method counterstained with van Gieson, toluidine blue (for metachromatic mucopolysaccharide according to the method of Glick),¹⁵ and periodic acid Schiff (PAS) to demonstrate carbohydrates. Details of these methods have been provided elsewhere.^{5, 6, 11}

In addition to the afore-mentioned new biopsy material, histological material reported upon previously^{11, 12} was also repeatedly referred to in order to check the findings from the present experiments. Biopsy specimens taken at various times after infliction of excised and incised wounds on more than 60 rabbits and 40 rats were also referred to and formed a background for the present study.

In the present study, 27 biopsies of healing forearm incisions were examined in serial sections according to the afore-mentioned methods.

OBSERVATIONS

Since details of the healing of incised and excised wounds have been reported previously^{4, 5, 7, 9, 11–13} repetition of our original

findings will be avoided as much as is consistent with a clear exposition of the observations in the present study.

The histology of the skin of the experimentally incised volar aspect of the forearm is portrayed in Fig. 1. Even in this low power photomicrograph it can be seen that the epidermis in this skin field is rather thick, with a well-developed stratum corneum of fine interlacing flakes and rather deep and regular rete pegs. Particularly clearly shown in Fig. 1 is the narrow but distinct and regular sub-epidermal band of fine fibred stratum papillaris of the dermis. This layer is fairly sharply demarcated from the deeper and much broader, coarser fibred stratum reticularis of the dermis. The hair follicles and sebaceous glands in this, as in other skin fields, are usually surrounded,

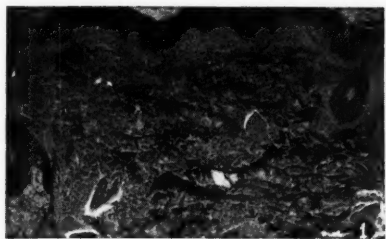


Fig. 1. Morphology of normal skin of the volar aspect of the forearm—the area used for the experimental incisions here described.

Note particularly the loose stratum corneum, the thickness of the epithelium, the depth of the rete pegs and the clearly demarcated subepidermal stratum papillaris which can also be seen extending around the hair follicle at reader's right and the sebaceous gland at reader's left. Modified Masson method. $\times 34$.

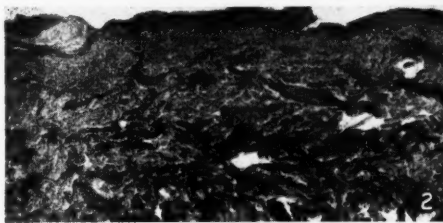


Fig. 2. Junction of abraded (right) with non-abraded skin of the forearm in one experimental subject. Note complete removal of epidermis, even that extending into the majority of the rete pegs. The stratum papillaris of the dermis has not been injured by the abrasion. Modified Masson method. $\times 34$.

even at their deepest extremities, by a fine fibred connective tissue layer equivalent to the superficial stratum papillaris of the dermis. Attention is drawn particularly to the distinction between the stratum papillaris and reticularis of the dermis because our studies indicate that the integrity of the former may play some important physiological role in determining the epidermal reactions to injury and the ultimate nature of the healing processes which supervene after various types of injuries. In particular, the existence of delicate, dendritic-like elastic fibrils in the stratum papillaris should be mentioned (Fig. 3).

Histological examination of the *abraded* areas of skin, taken from the experimental subjects at the time of the initial operation, revealed that the epidermis had been completely removed with only minor damage to the immediately underlying stratum papillaris of the dermis (Figs. 2 and 3). Only in one subject (the first abraded by us) was the stratum papillaris slightly damaged by the abrasion procedure. The resulting reactions, in this latter instance, will be referred to below. As can be seen from Fig. 3, even the delicate sub-epidermal dendritic-like elastic fibres of the stratum papillaris were left virtually intact.

HEALING OF THE ABRASIONS

The healing of the abraded epithelium, from the 5th to the 26th post-operative days, is clearly shown in Figs. 4–8, 12, 13, 15–17. Even at the 5th post-operative day (Figs. 4 and 5) the epithelium in the abraded area can be seen to have regenerated almost completely, to

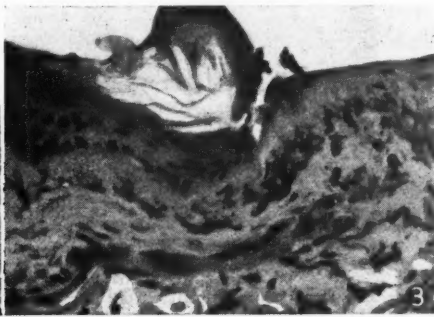


Fig. 3. High power view of junction between non-abraded (left) with abraded skin seen in Fig. 2, showing complete removal of the epidermis down to its basal layer and virtual intactness of the dendritic-like elastic fibres lying immediately subepidermally in the stratum papillaris of the dermis. Orcein-haematoxylin. $\times 720$.

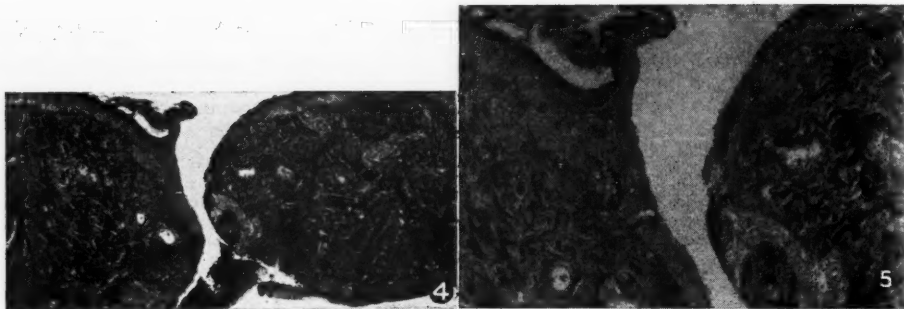


Fig. 4. Appearance of biopsy 5 days after abrasion and incision through this abraded area on the forearm; closed with interrupted silk sutures.

Note thickening of the epidermis at wound edges, with loss of rete pegs, and extensive-regeneration of epidermis even into the line of the incision. The gap between the two parts of the specimen, through the line of incision, was artifactual during processing, but demonstrates the virtual absence of connective tissue reactions by this time. Mallory's triple method. $\times 34$.

Fig. 5. High power view of Fig. 4 to show regenerated epidermis extending into the line of incision at left; just the tip of the regenerating epidermis is shown at the top right.

Note also absence of connective tissue reactions even in the stratum papillaris at this stage. Mallory's triple method. $\times 78$.

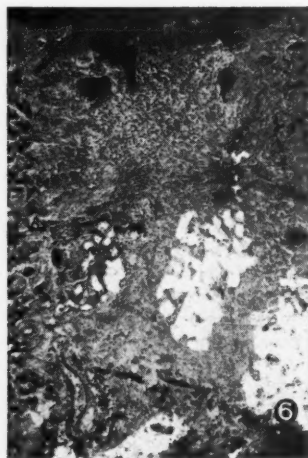


Fig. 6. Appearances, at tenth post-operative day, of line of incision in previously abraded and tape-closed incision of same patient whose normal epidermis is shown in Fig. 1.

Note marked hyperplasia of epidermis with extension of epidermal 'pseudo-pegs' into the underlying new connective tissue.

The new connective tissue is apparently generated primarily from the immediately subepidermal stratum papillaris above and from the deeper lying subcutaneous fat, below, which shows marked fibrotic changes.

Note also virtual absence of connective tissue reactions in the transected stratum reticularis of the dermis abutting the new connective tissue within the line of the incision. Mallory's triple method. $\times 34$.

have covered the denuded area and, on one side (reader's left in Figs. 4 and 5), to have extended almost into the line of the incision. Careful study of serial sections indicated that this epithelial regeneration was occurring from the edges of the abrasion, from occasional small 'pockets' of epithelium which originally constituted the deepest epidermal pegs and from all the hairs and glands in the area—including sweat gland ducts.

By the 10th and 11th days epithelium had completely covered the abraded area as well as the incision within such abrasions. The epithelium, at this time, is distinctly hyperplastic (Figs. 6-8, 17), but at no place, other than in the line of the incision and the suture needle punctures (when sutures were used), are any unusual epithelial invasions of the stratum papillaris apparent. This is particularly evident in Fig. 17, where the hyperplastic epithelium, with seemingly normal rete pegs, are seen between the epithelial 'invasions' or 'invaginations' at the incision (at left) and suture needle puncture wound (at right).

Even after such relatively superficial abraded injuries, the epithelium remains hyperplastic for at least 26 days, albeit there is no unusual intensification of the rete pegs in the abraded areas (see especially Fig. 14 at left). It must be realized, however, that incision alone (without an associated abrasion) stimulates the juxta-incisional epithelium to thicken somewhat with an associated slight diminution of the rete pegs (Fig. 10).

Thus, while epithelialization of the abraded skin is completed between the 5th and 10th

post-operative days, reconstitution of the original morphology of the epidermis almost invariably takes longer than 26 days. However, abrasion, *per se*, does not result in any invasions of the dermis by the regenerating epithelium. This would appear to be due to the absence of any rupture of the stratum papillaris within the abraded area.

In the single case where abrasion had, accidentally, been deep enough to damage the stratum papillaris, even though only superficially, there was a distinct localized increase in connective tissue cells, metachromasia of the ground substance, and later an increase of reticulin and collagen fibres within the injured stratum papillaris. This was the only instance in which abrasion alone was associated with any detectable dermal reaction.

These findings indicate that if epithelium alone is lost, it can be replaced by regeneration

unassociated with microscopically detectable reactions in the immediately abutting dermis other than vasomotor changes.

HEALING OF THE INCISIONS

Whether abraded or not, sutured or closed by adhesive tape, repair of the incisions followed the general pattern detailed previously.¹⁰ The present investigation provided ample substantiation for our original contentions that the widely accepted opinions on the histogenesis of the repair of cutaneous injuries require revision.

Briefly stated, the line of incision invariably became inverted and the epithelium bridged the gap in the tissue rapidly and before any significant connective tissue response was noted within the line of incision through the dermis itself. By the 5th post-operative day, in one abraded specimen in which the epithelium had not quite bridged and covered the incision, it can be seen (Figs. 4 and 5) that, at this time, there was virtually no connective tissue response in the dermal part of the incision. Consequently, although handled with the utmost care at biopsy, the specimen split easily through the incision during processing. By the 10th or 11th post-operative days connective tissue changes within the dermal portion of the incisions were well marked, especially in the immediately sub-epidermal area, and in the subcutaneous fat (Figs. 6-8, 10). Details of these changes have been given in previous reports.^{5, 7, 11, 12} Suffice it is to say here that the connective tissue reactions were most marked, both histologically and histochemically, in that part of the ruptured stratum papillaris immediately related to the epidermal invasions which regularly occur within the line of the incision or at the suture needle puncture wounds (Figs. 6, 7 and 17). That the transected stratum reticularis of the dermis is relatively inert, up to this time, is strikingly shown in Fig 8 where the reactions in the stratum papillaris and subcutaneous fat seem to have been drawn together, with a consequent widening of that part of the incision passing through the stratum reticularis.

In all specimens studied, both from the present and from previous series of biopsies of healing surgical incisions in Man and animals, the subcutaneous fat seems to play an active part in repair and appears to 'herniate' into the portion of the incision transecting stratum reticularis of the dermis. That this is a regular occurrence is shown particularly well in Figs. 6, 8 and 15, where the subcutaneous fat



Fig. 7. Appearance of incision made through non-abraded skin and closed by interrupted fine silk sutures from same subject and at same time as Fig. 6. The epidermis is less hyperplastic than that shown in Fig. 6 and there is marked 'invasion' of epidermis into the line of incision as well as upward growth of new epidermis from a sweat gland duct which happened to lie within the line of incision. Note once more the fibrosis within the line of incision and very little new connective tissue within the abutting transected stratum reticularis of the dermis. Mallory's triple method. $\times 34$.

can be seen *only* within the line of the incision. This indicates that only in this line is the subcutaneous fat 'drawn' towards the surface. We are well aware, as shown so clearly by Converse and Robb-Smith,² that normally the subcutaneous fat has irregular finger-like projections into the dermis. However, it seems most unlikely that both the incisions and all the biopsies were made by us only into such projections of fat. That the 'herniated' subcutaneous fat rapidly alters into a cellular, vascular and later fibrotic tissue is apparent in Figs. 6 and 15. In the latter figure, particularly, it can also be noted that the vessels, regenerating from the subcutaneous fat, are passing *vertically* towards the skin surface *into* the incision, and *not across it*, as might be expected if these new vessels were generated, parallel to the skin surface, from the transected dermis immediately abutting the incision, as maintained by many authorities. As stressed elsewhere, the stratum reticularis of the dermis remains remarkably inert throughout the repair process generally.^{11, 12}

New connective tissue is thus regenerated downwards from the stratum papillaris as well as upwards from the subcutaneous fat. This pattern of connective tissue regeneration, in healing incised wounds, may account for the fact that scars, of healed surgical incisions, usually become broader within the first 10 to 40 post-operative days. Such widening of scars may perhaps be due to the virtual insertion of two wedge-like projections of connec-

tive tissue (and associated new vessels) into that portion of the incision which passes through the stratum reticularis of the dermis. Only after the 30th-40th post-operative days, as the cellularity of the new connective tissue diminishes progressively and the new collagen fibres increase in amount and contract (resulting in obliteration of new vessels), do the incisional and suture needle puncture wound scars become both narrower and paler.

It would seem, on the basis of these findings, that to avoid undue widening and to provide the finest residual incisional scars, attention should be paid particularly to ensuring the closest possible apposition, not so much of the epidermis, but rather of the subcutaneous fat on the one hand and the immediately subepidermal stratum papillaris of the dermis on the other. In this respect our findings confirm, extend and provide a rational morphological basis for understanding the observations and practical suggestions for suturing previously recorded by Hartwell.¹⁷

That the epithelium 'invades' the dermis *only* in the line of the incision, and at the suture needle puncture wounds, is clearly manifested in Figs. 6-8, 10, 17. Serial sections of the biopsy material revealed that in many instances, as suspected, the epithelial wedges within the incisions, such as that shown in Fig. 7, were attributable *in part* to *upgrowth* of epithelium from regenerating sweat ducts (and in other instances from sebaceous glands and hair follicles). However, it is also clear from

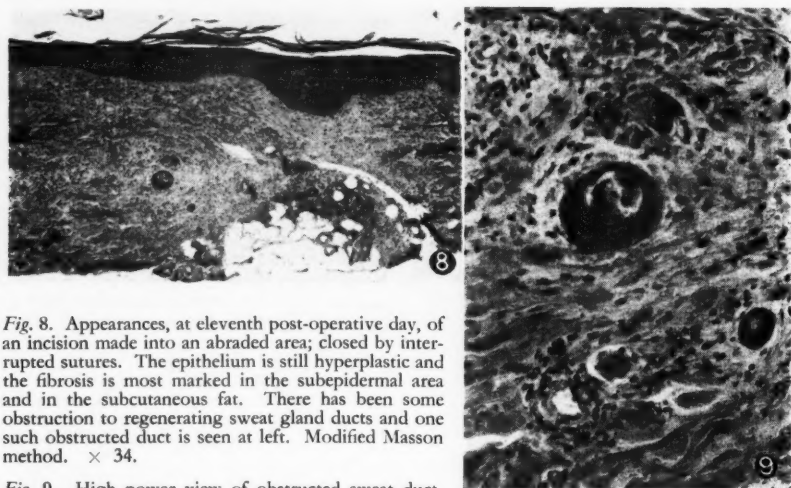


Fig. 8. Appearances, at eleventh post-operative day, of an incision made into an abraded area; closed by interrupted sutures. The epithelium is still hyperplastic and the fibrosis is most marked in the subepidermal area and in the subcutaneous fat. There has been some obstruction to regenerating sweat gland ducts and one such obstructed duct is seen at left. Modified Masson method. $\times 34$.

Fig. 9. High power view of obstructed sweat duct, shown at left of Fig. 8, with surrounding fibrosis and foreign body giant cell seen near top centre. Note tendency of connective tissue to become arranged concentrically around the hyperplastic regenerating sweat gland duct epithelium. Modified Masson method. $\times 320$.

Figs. 6, 7, 10 and 17 (all specimens having been studied in serial sections) that secondary epithelial spurs, *growing downwards from the surface*, also 'invade' the dermis. Such aberrant epithelium is frequently unrelated to the regenerating skin appendages and probably represents active ingrowths from the surface. This is especially clear in Fig. 17, where a well developed spur of epithelium, shown in serial section to originate only from the epidermis itself, can be seen, at the 11th post-operative day, invading especially along the outer aspects of one of the suture needle puncture wounds.

These aberrant epithelial growths invariably evoke vigorous connective tissue reactions which, while initially cellular, later undergo fibrosis and develop foreign body giant cells (Figs. 17-19). In many specimens (especially after the 10th post-operative day), the upgrowing severed sweat ducts, which fail to reach the surface before this time, were seen to have become obstructed by the new fibrous tissue nearer the surface. In all these instances the blind regenerating upper end of such obstructed ducts became enlarged, cystic and club-like (Figs. 8, 9, 12 and 15). As shown previously⁵ these club-like structures evoke strong connective tissue reactions with resulting surrounding fibrosis leading ultimately to their obliteration. If the regenerating sweat ducts reached the surface *before* such obstructive fibrosis had supervened (as shown in Fig. 7), they become slightly dilated but not cystic. As shown in the first

report from this laboratory,⁵ the epithelium from transected hair follicles and sebaceous glands seems to grow more vigorously than that from sweat ducts. Consequently the latter seem to become obstructed more frequently by the new connective tissue generated in healing wounds. This observation has been confirmed in the present study and conforms with the recently published findings of Lobitz *et al.*¹⁸

The connective tissue, apparently equivalent to the stratum papillaris, but which as mentioned above, normally also surrounds the sweat ducts and other skin appendages, becomes increasingly metachromatic during the first 5-10 post-operative days and apparently takes an active part in the subsequent fibrosis.

REACTIONS TO SUTURES

Although the epithelial reactions to sutures, used in closing surgical incisions, have been reported on in some detail elsewhere,^{7, 11, 13} we did not describe the alterations in such reactions induced by epidermal abrasions performed immediately before incision and suture closure, as was performed in the present human experiments.

As indicated, we have previously noted (and portrayed fully in a series of photomicrographs) that surface epithelium invariably invades the dermis if both the epidermis and stratum papillaris are ruptured. These epithelial invasions are always most vigorous along the

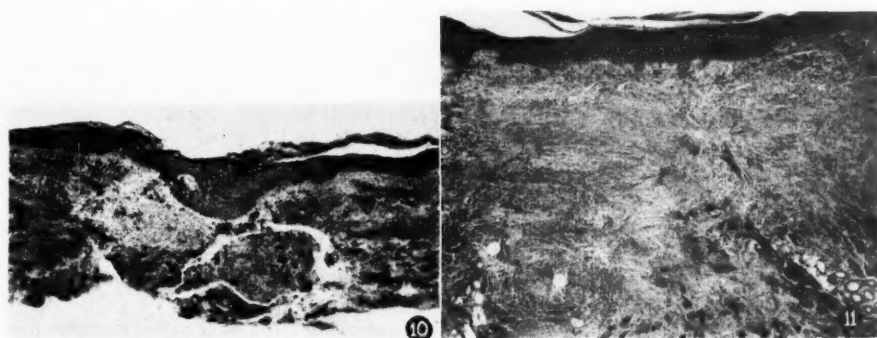


Fig. 10. Appearances of non-abraded tape-closed incision from the forearm of the same subject and at same time as shown in Figs. 8 and 9. The epithelium is far less hyperplastic than shown in Fig. 8 although there is nevertheless some 'invasion' of the epidermis into the line of the incision. The fibrotic reaction is once more confined to the line of the incision but shows signs of extending into the related stratum reticularis of the dermis. Union by new fibrous tissue is still incomplete, i.e. epithelial healing has been speedier than that in the fibrous tissue. Modified Masson method. $\times 34$.

Fig. 11. Appearances of incision through non-abraded and sutured wound 15 days post-operatively. Note still hyperplastic scar-like epithelium and residual epithelial 'spurs,' still extending into the underlying fibrous tissue, resembling regenerating rete pegs; these latter, as we have shown, are in fact 'pseudo-pegs.' Modified Masson method. $\times 34$.

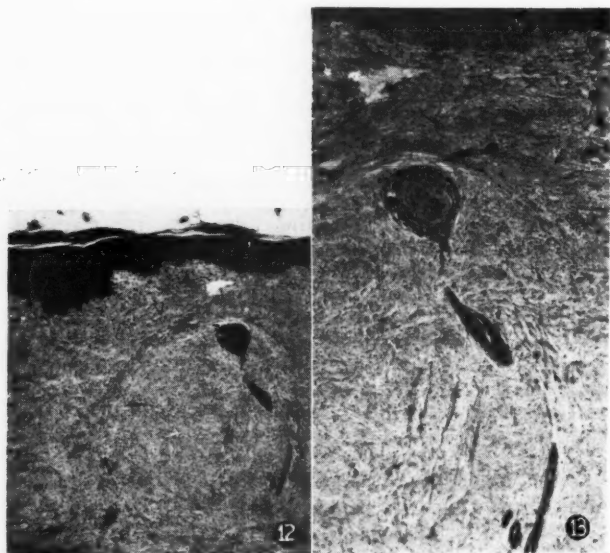


Fig. 12. Appearances of abraded and sutured wound from the forearm of the same case and at same time as shown in Fig. 11.

Note still markedly hyperplastic epithelium, compared with Fig. 11, and an obstructed club-shaped regenerating sweat duct within the line of the incision. 'Invading' epithelial spurs, within incision, are still apparent towards the left of this figure. The fibrotic reaction is only now clearly extending into the abutting transected stratum reticularis of the dermis. Modified Masson method. $\times 34$.

Fig. 13. High power view of the obstructed regenerating sweat duct shown in the centre of Fig. 12. The 'clubbing' of the obstructed sweat duct with internal keratinization and concentric surrounding fibrosis is clearly apparent. Vessels can be seen running vertically within and not across the incision. Modified Masson method. $\times 78$.

'outer' aspects of the sutures (relative to the incision) and may extend very deep into the dermis. Such peri- or juxta-sutural epithelial spurs also seem to evoke strong connective tissue reactions which, following removal of the sutures themselves, ultimately eliminate the aberrant epithelium while at the same time forming punctate 'suture' scars. Internally keratinizing epithelial pearls are usually formed

during the early stages of elimination of this aberrant epithelium by the dermal connective tissue reactions. The keratin, generated from the intradermal epithelial spurs, seems to be particularly irritating and appears to stimulate the development of numerous foreign body type multinucleated giant cells. It should also be mentioned here, that we have found these para-sutural epidermal invasions to have a distinct 'organizing' action on the connective tissue which develops around them. This was evidenced by the fact that wherever such new connective tissue came into contact with or approximated the aberrant epithelium, the fibroblasts and the associated new reticulin and collagen fibres soon become arranged parallel to the deep surface of such epithelium. As shown in Fig. 7 of the present study, this organizing action of the epithelium on new connective tissue also seems to be exerted even by regenerating sweat ducts as they attempt to grow towards the surface.

Apparently as a result of the vigorous stimulus to epithelial regeneration induced by the combined stimuli of incision, suture needle puncture wound and epidermal abrasions, the previously reported invasions of the epithelium along the outer aspects of the sutures are *markedly intensified in abraded and sutured wounds*. As shown in Fig. 17, by the 11th day the epithelial invasions at the suture were even more marked (i.e. thicker) and extended deeper into the dermis at the suture needle

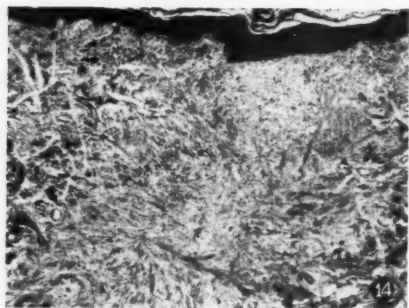


Fig. 14. Appearances of non-abraded tape-closed incision 19 days post-operatively. Marked fibrosis of the sub-epidermal stratum papillaris and of the deeper subcutaneous fat, as well as extension of this fibrous tissue reaction into the abutting transected stratum reticularis of the dermis are clearly apparent. The still hyperplastic epithelium has a scar-like appearance but several small residual 'spurs' of invasive epidermis, resembling regenerating rete pegs, are still apparent towards the centre of the figure. Mallory's triple method. $\times 34$.

puncture wounds than at the incision. These para-sutural epithelial invasions also occur, although to a much lesser degree, on the inner aspects of sutures, particularly in previously abraded areas. The vigorous connective tissue reactions evoked, apparently by the intradermal epithelium, may complicate the healing process considerably. As indicated in a previous study,¹¹ this is especially the case if the peri-sutural epithelial invasions unite, as they may, with those within the line of the incision.

The longer the sutures are allowed to remain, the deeper and more vigorous become the epithelial invasions into the dermis. As a consequence, the peri-sutural connective tissue reactions also become more marked. These invasive epithelial spurs are eliminated by the connective tissue shortly after the withdrawal of the stitches. There seems to be some connection between the continued presence of the sutures and the maintenance and even the continued growth in size of the peri-sutural epithelial downgrowths. Thus, in one of our volunteers a small portion of one of the black silk sutures was accidentally left behind in the dermis. After 79 days the subject complained of an intense itch directly over a tiny 'black-head-like' cyst lying adjacent to one of the sutured wounds. This cyst-like structure was resected (under local anaesthetic) and serially

sectioned. It yielded valuable information. Even in unstained sections, but particularly in sections stained with Mallory's phosphotungstic acid haematoxylin (which is a particularly excellent method for demonstrating keratin) it was easy to distinguish between the black suture and the associated epithelium. Our findings on this specimen are portrayed in Figs. 18 and 19. To appreciate these illustrations it is necessary to explain briefly the background.

As can be seen from Fig. 17, the para-sutural epithelial invasions are always most marked on the outer and under (deep or dermal) surfaces of the sutures. Only when such epithelium has penetrated deep into the dermis does it tend to ensheath the sutures completely. Consequently, near the skin surface, the sutures are not completely cuffed by epithelium. The more superficial aspects of the sutures are therefore in direct contact with the adjacent connective tissue, while the deeper aspects of the sutures have a distinct layer of epithelium interposed between the sutures and the surrounding connective tissues. Thus, after the sutures are withdrawn, the upper surface of the invading epithelium, especially near the surface (and the keratin which it generates) becomes exposed to direct contact with the connective tissue. A very vigorous foreign body reaction

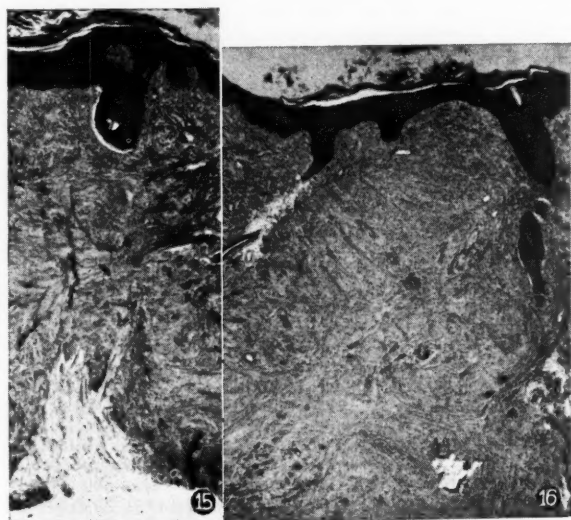


Fig. 16. Appearances of abraded and tape-closed incision from the forearm of the same subject as Fig. 15. Note the epithelium is less hyperplastic than that in Fig. 15. A sweat duct approaching the surface epithelium, and accounting for the 'spur' at left of the figure, is apparent. At right, a spur, due to a regenerating hair follicle near the surface, is also visible. However, in the centre of the wound is a short blunt epithelial spur generated from the epidermis itself. Modified Masson method. $\times 34$.

Fig. 15. Appearances of an abraded and suture-closed wound 26 days post-operatively. (From the same subject as Figs. 6 and 7 above).

Comparison of the thickness of the epithelium in this specimen with that shown at 19 days in Fig. 14 reveals the epidermis here to be still hyperplastic. Towards right of centre, a regenerating hair follicle can be seen joining the surface epithelium.

Note especially that new vessels run from the subcutaneous fat upwards towards the surface. These vessels run *vertically* and not across the line of the incision as they would be expected to do if arising from abutting transected stratum reticularis. Fibrotic reaction in the abutting transected stratum reticularis of the dermis is, however, now well advanced but no striking new blood vessels are yet apparent here.

At the bottom of this figure the fibrotic highly vascular wedge of subcutaneous fat is still apparent. Mallory's triple method. $\times 34$.

is immediately evoked, leading ultimately to the elimination of the ingrowing epithelium.

In Fig. 18 two transverse sections of the accidentally remaining portion of a suture can be seen (at A and B). As shown in Fig. 18, and more clearly in the higher powered view (Fig. 19), there is a vigorous foreign body and connective tissue reaction to the keratin generated by the incomplete peri-sutural epithelial

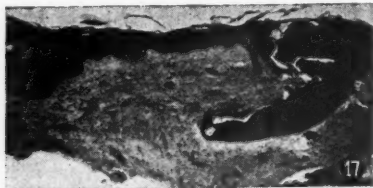


Fig. 17. Reaction to sutures, at 11 days post-operatively, related to an incision in the same subject as Fig. 10. At left is the typical triangular 'spur' of epithelium which has invaded into the line of incision while, at right, a much more vigorous epithelial invasion along the suture is shown—especially along the inferior aspect of the suture. Note also, between these two 'spurs,' the complete regeneration of the abraded epithelium without any subepithelial connective tissue reaction. The connective tissue reactions are confined to the incision and around the suture needle puncture wound. Mallory's triple method. $\times 17$.

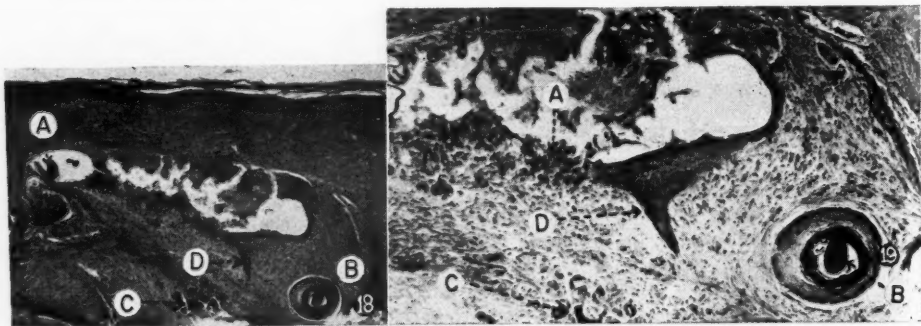


Fig. 18. Itchy 'cyst' which developed around a residual piece of suture 79 days post-operatively. At reader's right, at B towards bottom, the suture can be seen completely surrounded by a cuff of epithelium which was shown, in serial section, to have been regenerated from the surface. At A, far left, are evident the remains of the perisutural epithelial reaction with marked foreign body giant cell reaction and fibrosis to the partially exposed suture and associated remains of the epithelial downgrowth around the suture. Note the relation of this regenerating epithelium to the sweat gland below (C). In serial section the spur of epithelium, at D, was shown to be connected with the regenerating duct from the sweat gland shown at C. Mallory's phosphotungstic acid haematoxylin. $\times 34$.

Fig. 19. High power of a portion of Fig. 18 to demonstrate the foreign body reaction at a site of incomplete cuffing of the suture with epithelium (A), absence of such foreign body reaction either to suture or to epithelium where the suture is completely cuffed by epithelium (B); the sweat gland mentioned above is shown at C while the spur of epithelium constituting the upward growth of its obstructed duct is clearly shown at D. Same method as Fig. 18. $\times 78$.

sheath nearer the surface (A). Slightly deeper in the dermis, the epithelium completely ensheathes the suture (at B), and although there is a strong fibrotic reaction around this epithelium-encased stitch, no foreign body giant cells were detected in any of the serial sections in this location. Thus, the keratin from the invasive epithelium is a stronger irritant to the connective tissue than either the deep (outer) surface of the peri-sutural epithelial cuff or the suture itself. These findings confirm Glücksmann's reports¹⁶ on the fibrogenic action of keratin from implanted skin.

Serial sections also divulged that, in this specimen, a regenerating sweat duct from a nearby gland (Fig. 19 C and D, respectively) communicated with the peri-sutural epithelial lining (and cyst), and apparently contributed epithelium to that from the surface surrounding the sutures. We have previously shown¹¹ that this can occur not only from sweat ducts but also from other skin appendages, accidentally transfixes by sutures. Nevertheless, serial sections of biopsy specimens, taken at almost every early post-operative day in the present experiment (i.e. up to and including day 5), leave no doubt that there is a vigorous down-growth into, or invasion of the dermis by the surface epithelium—once the stratum papillaris has been ruptured and the breach has been kept open for some time. Most of the peri-

sutural epithelium seems, in fact, to be derived from the surface.

The persistence of the peri-sutural epithelium, so deep in the dermis and for so long a time, was encountered in only this single instance where a piece of suture had been left behind. This seems to provide strong indication that the presence of the suture somehow improved the viability of the aberrant epithelium, thus permitting it to withstand so long the onslaught of the connective tissue. However, this possibility can only be substantiated by suitably planned experiments. Such experiments merit execution, because the findings may provide a better understanding of the factors which permit the survival (and even hyperplasia) of aberrant epithelium—both benign and neoplastic.

HEALING OF TAPED AND ABRADED WOUNDS

When adhesive tape was used to close the incisions, both the epithelial and the connective tissue reactions were less vigorous—both in abraded and in non-abraded incisions. Thus, in Fig. 7, the hyperplastic surface epithelium and the epithelial spurs, vigorously invading in and around the line of incision, are shown in a wound that was abraded and sutured 10 days previously. Compared with this, the surface epithelium is much less hyperplastic and the epithelial spurs are much less well developed in the non-abraded and 'taped' incisions (Fig. 10). These differences persist to a much later post-operative date. Even at 19 days (Fig. 14) the surface epithelium adjacent to a non-abraded and taped wound, had almost acquired its original morphology (compare surface epithelium at right, Fig. 14, with that in Fig. 1), while as late as 26 days post-operatively (Fig. 15) the epithelium, both of the surface and that 'invading' the incision, was still quite markedly hyperplastic in the case of the sutured abraded wound.

Abrasion followed by suturing thus seemed to evoke much more vigorous and more prolonged epithelial hyperplasia, throughout the healing zone, than did abrasion combined with tape closure (compare Figs. 15 and 16, both from the same volunteer).

The invasions of epithelium along sutures and their absence in unsutured but tape-closed incisions has both advantages and disadvantages. Since such epithelial invasions along sutures promote vigorous connective tissue reactions, the extra connective tissue reactions, about the sutures, act as 'stays' to the incision itself, thus increasing the tensile strength of the wound within a few days of

the operation. The absence, from tape-closed wounds, of such peri-sutural epithelial invasions, and their associated connective tissue responses, is in part responsible for the fact that the latter means of closure is associated with wounds of poorer tensile strength during the first 10–12 post-operative days. However, as we have found from experience, if the tape is maintained in position for 14 or more days post-operatively, then the tensile strength of the tape-closed wounds seems to become completely comparable with that of sutured wounds.

As a result of the afore-mentioned and previous histological studies, as well as Mr. Jack Penn's now extensive practical experience with the use of tape, the following practice is recommended as routine:

If trans-epidermal sutures are used, alternate sutures should be withdrawn on the second or third post-operative day in order to diminish the extent of the epidermal invasion into the dermis along these sutures.

At the time of withdrawal of such sutures, tape is applied in place of the suture, thus providing the support necessary, during the next 10 to 14 post-operative days, while new connective tissue is developing in and around the incision itself.

Mr. Penn, as a result of his now extensive use of this method, is thoroughly satisfied that this combination of early removal of sutures with simultaneous and prolonged maintenance of tape results in the finest, most delicate scars and eliminates the usual suture puncture wound reactions.

DISCUSSION

Several matters of practical and theoretical interest arise from the present study. Some of the points of more practical importance have already been referred to briefly. Consequently it is intended here to focus attention primarily on matters of theoretical interest.

Our findings regarding the regeneration of epidermis following abrasion are in conformity with those of many other workers, viz. that the epithelium regenerates extremely rapidly. There is now considerable evidence, too, that such regeneration occurs from *all* sources of epidermis in the injured area, i.e. from the surface, from pilo-sebaceous and from sweat gland epithelium.^{5, 7, 11, 12, 20, 21}

Of considerable importance, both theoretically and practically, is our finding that epidermal regeneration is unaccompanied by significant morphological response in the dermis unless the stratum papillaris at least is injured, either simultaneously with the epidermal trauma or perhaps even independently. Emphasis has previously been placed on the striking difference between *regeneration*, i.e. reconstruction of the original archi-

ture of an injured tissue, as opposed to *repair*, while healing of injuries is associated with scar tissue formation with consequent derangements of the original architecture of the affected part.^{4, 7-9, 14} The findings presented here indicate that, as far as the skin is concerned, only when the stratum papillaris is injured is *repair* likely to supervene; the attendant architectural distortions seem to be a consequence of that train of events in the *connective tissues* which several investigations have now established to be an inevitable normal sequel of injury to such tissues.^{1, 3, 19, 22} On this basis, it seems justifiable to consider the results here presented as substantiating, factually, our previous contention that the maintenance of the normal arrangement at least of the cutaneous epithelium, either on the surface or in the appendages, is in large measure a function of the 'organizing' capacity of the related connective tissues. Almost any disturbance of the connective tissues, of sufficient duration or intensity, and especially in the connective tissues comprising the stratum papillaris, seems to carry some implication for the behaviour of the immediately related cutaneous epithelium, wherever it may lie. It was not surprising, therefore, that even total removal of the surface epidermis, by abrasion, *without* involvement of the stratum papillaris, should be followed by complete restoration of the epidermal architecture. On the other hand, even superficial injuries, maintained breaches or even metabolic trauma to the stratum papillaris (such as that induced by ionizing radiations) is likely to be, and usually is followed by epidermal deformities of varying magnitude. Only in this way can, for example, the supervention of punctate scars in relation to sutures be explained.

On this basis, it is indeed surprising that similar scars do not occur more frequently in relation to intramuscular injections, especially when wide-bore needles are used. This matter has also been investigated by us, and it can here be stated that only if the needle track through the stratum papillaris is kept patent for more than 24-48 hours (either by accidentally liberated blood which clots or by the injected material) will transcutaneous punctures lead to punctate scars. This evidence adds further support to our view that the architecture of the epidermis is in large measure determined by the reactivity of the underlying related dermis.

These findings provide a reasonable basis for the view, previously expressed and now

supported by considerable experimental data^{4-6, 8, 9, 11, 12, 14, 19} that neoplasia, in the skin at least, is probably due in large measure to some metabolic and/or structural disorder of the dermis, which, in consequence, becomes incapable of exerting its normal 'organizing actions' on the epidermis—either at the surface or at deeper lying appendages. This view is in conformity with a similar opinion expressed by Pincus.²⁰

The present findings also provide substantiation for our previous report^{5, 11, 12} that some forms of milia may arise following obstruction, by regenerating connective tissue, of transected sweat glands. This opinion has also been confirmed by the elegant experiments of Lobitz *et al.*¹⁸ and substantiates opinions recently expressed by Pincus.²¹

Of theoretical interest, too, are the present findings, once more confirming our previous observations^{7, 12-14} that surface epithelium regularly invades the underlying connective tissues during repair of dermal injuries. Once within the healthy dermis such 'invasive' epithelium almost invariably evokes vigorous fibrotic reactions. The ultimate fate of the reactions so evoked would seem to be a function of both the nature of the epithelial proliferation as well as of the reactivity of the dermis.^{8, 9} This finding accounts for several important aspects of wound healing, including the fact that only *after* epidermal invasions does the related connective tissue respond actively. Thus, at one or other stage of repair, the epidermis can and does act as a stimulator of the connective tissues. That epithelium can, under certain circumstances also 'organize' dermal derivatives is here once more clearly apparent, as it was before^{11, 13, 14} in the arrangement of new connective tissue parallel to such aberrant epithelium (see especially Fig. 19 B above).

The fact that the normal dermis can eliminate aberrant epithelium is again shown from the present study of the histogenesis of the reactions at the line of incision and in relation to sutures.

Thus, as shown before, and here confirmed in new circumstances, at different stages of healing the epidermis and then the dermis seem to act in turn as organizers of those events which culminate in the repair of deep cutaneous injuries. Since regeneration of abraded surface epithelium alone was *not* found to be associated with dermal reactions, it follows that there are certain properties of the epidermis itself which allow it to maintain its integrity by its own regenerative capacity.

However, once the dermis has become involved, the epidermal integrity may well be threatened as a consequence of the dermal injury itself. Major or minor architectural disorganizations of the epidermis may follow.

Also emerging from the present study is the apparent *summation* of stimuli when epidermis and dermis are simultaneously involved as, for example, when epidermal abrasions are combined with incisions or when such incisions are closed by sutures as opposed to adhesive tape.

All these findings, elicited from the study of healing cutaneous injuries, may be of some significance for future investigations of epithelial-connective tissue relations, not only in the analysis of cutaneous neoplasia but perhaps also in the study of other types of new growths.

SUMMARY AND CONCLUSIONS

1. Abraded wounds, involving loss of the entire thickness of the epidermis but without damage to or rupture of the underlying stratum papillaris of the dermis, will heal in less than 10 days by regeneration of the epithelium with consequent complete restitution of the normal epidermal structure. Epithelium is regenerated from the surface, from hair follicles and from sweat ducts.

No connective tissue reaction is evoked by such injuries apart from a slight and inconstant increase in metachromatically staining ground substance, usually in relation to sites where the traumatic abrasion has been deep enough to injure the related stratum papillaris.

Regenerated epidermis in abraded areas remains hyperplastic for more than 3 weeks after abrasion.

2. Damage to the stratum papillaris, by deep abrasions or by maintained interruption, as in suture puncture wounds or deep incisions, is regularly followed by *two* reactions, viz.

(a) Varying degrees of invasion of dermis by regenerating epithelium, and

(b) Histologically and histochemically detectable changes and later fibrosis of the underlying connective tissue, especially of the stratum papillaris and injured subcutaneous fat.

3. The importance of rupture of the stratum papillaris of the epidermis, as an apparently essential stimulus for these two reactions, is evinced by comparing the epithelial and the connective tissue reactions following abrasion alone as contrasted with abrasion together with incision or puncture of the stratum papillaris, with or without abrasion.

4. Abrasion results in increases both in the rate and degree of epithelial reactions to incisions or to the suture needle puncture wounds. Apart from inducing hyperplasia of surface epithelium, abrasions intensify the degree of invasiveness of epithelium at sites of rupture of the stratum papillaris (by the incision or by suture needle puncture wounds).

At these sites of more intense epithelial invasions of the dermis, the connective tissue reactions (leading to fibrosis) are also increased (apparently due to the aberrant epithelium itself) and this seems to intensify the ultimate scars. Therefore, abrasion of epithelium, at the time of incision, is not to be encouraged as a possible means of *preventing* or diminishing incisional scars.

On this basis, too, it can be anticipated that deep abrasions, likely to destroy the stratum papillaris of the epidermis, will result in healing with some dermal fibrosis and 'scar-like' epithelium due to incomplete or markedly delayed reconstitution of the epidermis with consequent alterations in the texture of such deeply abraded areas.

Therefore, to achieve the best cosmetic results, abrasions should, wherever possible, not be deep enough to damage the stratum papillaris and, in any event, should be of consistent depth over the entire area (especially on the face).

5. Tape-closure of incisions (without preceding abrasion) is associated with the least vigorous epithelial invasions of the dermis during wound healing.

6. Epithelial invasions along sutures, from puncture sites in the epidermis, may be well advanced by the 10th post-operative day. Such epithelial invasions intensify the connective tissue reactions along the length of the sutures, and may result in obstruction of trans-fixed sweat gland ducts and hair follicles. Some of the resulting complications to sutures are the associated vigorous foreign body reactions to the invading epithelium about the sutures and the epithelial cysts attendant on fibrous obstructions to sweat ducts.

7. Some aspects of epithelial-connective tissue reactions, as observed in healing wounds, are discussed with particular reference to the importance of the dermal reactions and of damage to the stratum papillaris in particular, for understanding certain aspects of the histogenesis of regeneration as opposed to repair.

Possible implications of these findings for understanding epithelial-connective tissue relations in neoplasia are also indicated.

OPSOMMING

1. Abrasiewonde wat die verlies van die hele dikte van die opperhuid meebring, maar geen beskadiging of skeuring van die onderliggende stratum papillaris van die onderhuid nie, sal binne minder as 10 dae gesond word deur die regenerasie van die epiteel met daaropvolgende algehele herstel van die normale onderhuidstruktuur. Epiteel word geregeneer vanaf die oppervlakte, vanaf haarsakkies en vanaf sweetbuisse. Geen bindweefsel-reaksie word te voorskyn geroep deur sodanige beserings nie, afgesien van 'n geringe en onbestendige vermeerdering van die metachromaties vlekkeende grondstof, gewoonlik in verband met die plekke waar die traumatiese abrasie diep genoeg was om die verwante stratum papillaris te beseer. Geregeneerde opperhuid in abrasie-streke bly hiperplasties gedurende meer as 3 weke ná die abrasie.

2. Beskadiging van die stratum papillaris deur diep abrasies of deur volgehoue interrupsie, soos in die geval van hegingspunksiewonde of diep insnydings, word reëlmag deur twee reaksies opgevolg, naamlik: (a) 'n uiteenlopende mate van invasie van die onderhuid deur regenererende epiteel, en (b) histologies en histochemies waarneembare veranderinge en later ook deur fibrose van die onderliggende bindweefsel, veral van die stratum papillaris en die beseerde onderhuidsvet.

3. Die belangrikheid van die skeuring van die stratum papillaris van die opperhuid as 'n skynbaar noodsaaklike prikkel vir laasgenoemde twee reaksies, word aan die lig gebring deur 'n vergelyking tussen die epiteel- en die bindweefselreaksie volgende op abrasie alleen, en abrasie tesame met insnyding of punksie van die stratum papillaris, met of sonder abrasie.

4. Abrasie loop uit op vermeerderings in sowel die tempo as die mate van epiteelreaksies op insnydings of op hegingsnaald-punksiewonde. Afgesien van die feit dat abrasies hiperplasie van die oppervlakte-epiteel te voorskyn roep, verskerp hulle ook die invalsterkte van epiteel by skeurplekke in die stratum papillaris (deur insnyding of deur hegingsnaald-punksiewonde). Op hierdie plekke van intenser epiteelinvale in die onderhuid is die bindweefselreaksies (wat aanleiding tot fibrose gee) ook groter (wat skynbaar aan die afwykende epiteel self te danke is), en dit skyn asof dit die uiteindelijke littekens vererger. Abrasie van epiteel ten tyde van insnyding moet derhalwe nie aangemoedig word as 'n moontlike middel om insnydingslittekens te voorkom of te verminder nie. Op hierdie grondslag kan daar ook verwag word dat diep abrasies wat waarskynlik die stratum papillaris van die opperhuid sal vernietig, op 'n genesing sal uitloop wat gekenmerk word deur 'n mate van onderhuidsfibrose en 'litteken-agtige' epiteel voortspruitende uit onvolledige of opmerklik vertraagde herkonstitusie van die opperhuid met daaropvolgende veranderinge in die tekstuur van sodanige diep geabradeerde oppervlaktes. Om die beste kosmetiese resultate te verseker, moet abrasies, waar moontlik, nie so diep wees dat hulle die stratum papillaris beskadig nie. In elk geval moet hulle van 'n egalige diepte dwarsoor die hele oppervlakte (veral op die gesig) wees.

5. Insnydings wat met band gesluit is (sonder voorafgaande abrasie) is geassosieer met die mins kragtige epiteelinvale van die onderhuid tydens die genesing van die wond.

6. Epiteelinvale langs hegingsnate van punksieplekke in die opperhuid, kan teen die 10de dag na die operasie goed gevorderd wees. Sodanige epiteel-

invale verskerp die bindweefselreaksies langs die lengte van die heging, en kan op obstruksie van deursteekte sweetklierbuisse en haarsakkies uitloop. Party van die daaruit voortspruitende verwikkelinge vir hegings is die verwante kragdadige reaksie van vreemde liggame op die invallende epiteel rondom die hegings en die epiteelsiste wat veselobstruksies van die sweetbuisse vergesel.

7. Sommige aspekte van epiteel-bindweefselreaksies soos waargeneem in genesende wonde, word bespreek met besondere verwysing na die belangrikheid van onderhuidsreaksies, en veral die beskadiging van die stratum papillaris, vir 'n behoorlike begrip van sekere aspekte van die histogenese van regenerasie in teenstelling met herstel. Die moontlike implikasies van hierdie bevindings vir 'n begrip van epiteel-bindweefselverhoudinge in neoplasie word ook aangedui.

We are glad to acknowledge the generous grant from the Schlesinger Organization, South Africa, which made the execution and the presentation of this work possible, and to thank Mrs. Florence Powell for her grant-in-aid of an indispensable Cancer Research Library.

Adhesive Tapes South Africa (Pty.) Ltd., agents for 'Sellotape,' kindly defrayed part of the cost of this publication. Mrs. A. Hart, Mrs. P. Kruger and Miss A. Killerby rendered valuable assistance with the operations, histological technique and photomicrographs respectively; Miss M. D. Carolan's secretarial assistance is also gratefully acknowledged.

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NOTES AND NEWS : BERIGTE

Dr. Loyce Hillman, M.B., B.Ch., D.A., has commenced practice as a Specialist Anaesthetist, in partnership with Dr. Morris Fisher and Dr. Stanley Hersch, at 162 Lister Buildings, Jeppe Street, Johannesburg. (Telephones: — Rooms: 22-3444 and 22-5698; Residence: 44-6111).

* * *

MEDICAL PRACTITIONERS NOMINATED FOR ELECTION TO THE SOUTH AFRICAN MEDICAL COUNCIL

Black, James (Johannesburg).
Bloom, Arthur (Durban).
Blumberg, Harry Israel (Klerksdorp).
Braun, Loswel Israel Braude (Johannesburg).
Bremer, Julius Karl (Pretoria).
Broomberg, Aaron (Durban).
Cluver, Eustace Henry (Johannesburg).
De Villiers, Beck (Bloemfontein).
Freed, Louis Franklin (Johannesburg).
Grant-Whyte, Harry (Durban).
Impey, Robert Lancelot (Cape Town).
Radford, Aubrey (Durban).
Schaffer, Rudolph (Queenstown).
Schepers, Gerrit Willem (Johannesburg).
Shapiro, Charles (Cape Town).
Shapiro, Maurice (Johannesburg).
Sichel, Alan William Stuart (Cape Town).
Tonkin, Michael Edmund Lee (Johannesburg).
Troskie, George Frederik Christiaan (Kroonstad).
Turton, Edwin Wilberforce (Boksburg North).
Vercueil, Leon Olivier (Florida).
Wagner, Philipp Frederick Henry (East London).

Prof. J. H. Louw, of the Department of Surgery, University of Cape Town (accompanied by Mrs. Louw) will leave for an extended post-graduate visit overseas towards the end of December.

Professor Louw has been awarded a Carnegie Grant for travel and study in the United States.

On his return from the U.S.A., Professor Louw will visit London, where he has been invited by Professor Sir James Paterson Ross, K.C.V.O., President of the Royal College of Surgeons of England, to deliver the Moynihan Lecture at the Royal College.

Professor Louw will speak on *The Pathogenesis of Congenital Intestinal Atresia*.

Professor and Mrs. Louw will spend, in all, about 4 months overseas.

* * *

THE FOURTH INTERNATIONAL GOITRE CONFERENCE, LONDON, 1960

The American Goitre Association and the London Thyroid Club are holding the Fourth International Goitre Conference, in London, from 5 to 9 July 1960. This will be 10 days before the International Endocrine Conference in Copenhagen.

Those who wish to submit papers for consideration by the Programme Committee, should send abstracts not later than 31 December 1959, to Dr. Selwyn Taylor, 3, Roedean Crescent, London, S.W.15, England. He will also supply any further information required by those who are interested in this Congress.

Dr. L. Friedlander has commenced practice as a specialist in diseases of children at 606 Medical Arts Building, Corner of Jeppe and Troye Streets, Johannesburg. (Telephones:— Rooms: 23-9258; Residence: 42-7936).

PRETORIA SOCIETY ON ALCOHOLISM

This Society recently arranged a conference to mark the first anniversary of the 'Castle Carey' Clinic which is conducted by the Society.

The guest speakers were:

The Hon. Mr. J. J. Serfontein, Minister of Social Welfare; Dr. R. A. Mathews, Chairman of the S.A. National Council on Alcoholism.

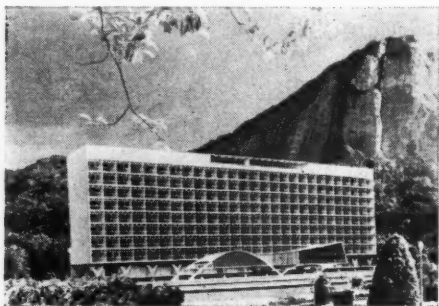
FIRST DRENNAN LECTURE

The first in the series of *Drennan Lectures*, under the sponsorship of the M. R. Drennan Fund, University of Cape Town, was delivered by Dr. Joseph S. Weiner (M.Sc. (Rand), M.A. (Oxford), Ph.D., M.R.C.S., L.R.C.P. (Lond.)), Reader in Physical Anthropology and Assistant Director of the Medical Research Council Unit for Climatic and Welfare Efficiency in the University of Oxford.

Dr. Weiner spoke on *The Tropical Origin of Man* in the Physiology Lecture Theatre, Medical School, Observatory, C.P., on Monday, 10 November at 8.15 p.m.

NEW 242-BED HOSPITAL TO BE OPENED IN BRAZIL

A new 242-bed hospital is being constructed at the base of Rio's majestic 2,272-foot mountain, 'Corcovado.'



The Hospital Sud America, an all glass and concrete, 10-storey building, will be laid out in a park-line setting in the City's Botânico district, site of a world-famous botanical garden. It will overlook Lake Rodrigo de Freitas, which flows into the sea.

Ample areas are planned for both the front and the rear of the building. The 7th, 8th, 9th and 10th floors, where the operating room, maternity ward and de luxe apartments are located, will be air conditioned with Worthington equipment.

The structure is expected to be one of the most beautiful in South America. The architect is the

well-known Brazilian, Oscar Niemeyer, one of the designers of the United Nations buildings in the United States.

The new hospital is one of many recently constructed in Brazil. One of them—the new 'Hiapetec' Hospital at Ipirango, a Sao Paulo suburb—boasts a total of 14 operating rooms. All are air conditioned in the summer and heated in the winter by special Worthington equipment.

MEDICAL MEMBERS OF PARLIAMENT



VII: Dr. B. Wilson, M.P. (Hospital).

MR. W. H. BARNARD, B.A.

THE NEW REGISTRAR OF THE SOUTH AFRICAN MEDICAL COUNCIL

The medical profession will welcome the news that Mr. W. H. Barnard, formerly Assistant Registrar, has been recommended for appointment as Registrar of the South African Medical and Dental Council.

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Mr. Barnard's genial personality, his friendliness and his helpfulness to all medical practitioners who have had occasion to consult him, are well known throughout the country. His assumption of duties as Registrar will do much to smooth the workings of the Council, in so far as they affect medical practitioners and will add greatly to the creation of good relations between the members of the profession and the Council.

Mr. Barnard was born in Ventersburg, Orange Free State, on 21 April 1914. He matriculated at Boshoff in the same province and graduated from Grey University College (now the University of the Orange Free State) as a B.A. with double honours in History and Economics in 1935.

After having been awarded a Rhodes Scholarship Mr. Barnard spent 10 months in Berlin where he read Economics at the University of Berlin. At Oxford he read Philosophy, Politics and Economics.

Mr. Barnard was formerly (for 4 years) Assistant Registrar at the University of the Witwatersrand Medical School. He has been Assistant Registrar of the Medical Council for the past 12 years. His new duties as Registrar will begin in January 1959.

THE WORLD MEDICAL ASSOCIATION

COPENHAGEN MEETING

The twelfth General Assembly of the World Medical Association (held in Copenhagen this year) brought together physician-delegates from over 50 free nations for a benevolent exchange of scientific knowledge.

'When men search for peace through the processes of international politics, there is always implicit a frightful alternative, the possibility of war and death,' declared an American physician, Dr. John Henderson, in the keynote address at Copenhagen. 'We physicians face no such dilemma since we pursue only the objectives of the alleviation of suffering and the preservation of life.'

Dr. Henderson, who is Medical Director of Johnson and Johnson, New Brunswick, New Jersey, hailed the International Exhibition of Medical Films, a feature this year for the first time of the WMA meeting, as a significant symbol of the fact that science knows no boundaries and speaks with a universal tongue.

While the life span in Western Europe and the United States has increased amazingly in recent years, age-old afflictions are still a major problem in the underdeveloped areas of the world. Disease breeds discontent and discontent breeds trouble.

'Through the co-operation of physicians and the total health team in all countries of the world,' Dr. Henderson declared, 'there can be created a level of world health and world unity which could not otherwise be attained. This is the challenge which we of the World Medical Association acknowledge and accept.'

THE WELLCOME MUSEUM AND WORLD HEALTH

The Wellcome Museum of Medical Science in the Euston Road, London, reopened in March 1958 with its exhibits completely reorganized. This came appropriately at a time when the World Health Organization celebrated its 10th anniversary. This is no casual coincidence. Devoted as it is to the late Sir Henry Wellcome's consuming interest, tropical medicine, the Museum had found its subject matter turned topsy-turvy by the massive international attack on the great killing diseases.

The Museum is no dusty record of what was. It is an institution where modern medicine is taught by synoptic methods. Since it was found in 1914 it has been under constant revision, and nowadays 10,000 doctors, students and nurses visit it each year to examine the specimens and study the expositions on the panels.

But the rapid changes of the past 10 years have altered the basic conception of tropical medicine. Indeed, it has now been transformed into *Medicine in the Tropics*. Malaria, small-pox, leprosy, yellow fever and so forth are being conquered, revealing more familiar complaints such as tuberculosis, measles and whooping cough among the inhabitants of the tropics. This change is now properly reflected in the organization of the Museum—poliomyelitis, for example, to-day merits as much panel space as does cholera.

By far the largest exhibit concerns malaria, but, like the other traditional diseases, it is close to capitulation, and the Museum staff regard this as their 'last fling' before it is relegated as a clinical curiosity.

Scientific advances in medicine, and indeed the Wellcome Museum itself, have helped to make possible this transformation of the world scene. But equally important is the fact that 88 countries now subscribe, as members of WHO, to the idea that health is indivisible. Where practice follows so rapidly on the heels of research, WHO sees to it that skills and knowledge are properly shared.

[From *The New Scientist*, 27 March 1958].

PREPARATE EN TOESTELLE

BELLERGAL RETARD

Sandoz Limited kondig die beskikbaarstelling aan van *Bellergal Retard*, 'n nuwe lankwerkende vorm van hul bewese *Bellergal*.

Beskriving: *Bellergal Retard*-tablette bevat twee keer soveel ergotamien, belladonna-alkaloïede en fenobarbitoon as gewone *Bellergal*-tablette. Die helfte minder *Retard*-tablette is dus voldoende om die verlangde terapeutiese effek te weeg te bring:

Totale linksdraaiende alkaloïede van belladonna-blaar (Bellafoline) ... 0.2 mg.

Ergotamientartraat B.P. ... 0.6 mg.
Fenobarbitoon B.P. ... 40.0 mg.

Bellergal Retard-tablette bestaan uit 3 fraksies—geel, rooi en groen. Twee daarvan het 'n vertraagde uitwerking wat onderskeidelik na 4 en 8 uur begin. Die volle effek word dus versprei oor 'n tydperk van 10 tot 12 uur nadat die tablet geneem is.

Die veelvoudige vrystelling van aktiewe bestanddele:

Verseker egalige kalmering dwarsdeur die dag en nag;

AFRICAN

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ouncil.

Voorkom dat simptome van verlaagde konsentrasie

weer verskyn as gevolg van die geneesmiddel.

Werkingsmetode: *Bellergal* verhoed die deurgang van oormatige prikkels van die psige na die soma in psigosomatiese (spannings- en funksionele) toestande.

Indikasies: Somatiese openbarings van funksionele en spanningskwale, en in besonder:

Die klimakterium, premenstruele spanning, swangerskapsnaarheid, funksionele ginekologiese toestande;

Die „Effort“ sindroom (hartneurose en neurosirkulatoriese astenie);

Gastro-intestinale hiper-

sekresie en hypermotiliteit (ulkus);

Psigosomatiese vel toestande (neurodermatitis, pruritus, ens.);

Voorkoming van migraine.

Dosis: 1 *Bellergal Retard*-tablet in die oggend.

1 *Bellergal Retard*-tablet saans.

Indien nodig kan die dosis tot 3 *Retard*-tablette per dag vermeerder word, maar hierdie dosis moet nie oorskry word nie.

Verpakking: Flesse van 20, 100 en 250 *Retard*-tablette.

Verspreiders: Alex. Lipworth Limited, Posbus 4461, Johannesburg; Posbus 4838, Kaapstad; Posbus 1988, Durban; Posbus 3188, Port Elizabeth.

COBADER

British Drug Houses kondig die beskikbaarstelling aan van *Cobader*-salf wat 1% hidrokkortison B.P.C. in 'n waterafstotende basis bevat.

Indikasies: Die spesiale nuttigheid van *Cobader*-salf moet toegeskryf word aan die basis waarin die

hidrokkortison vervat is. Die waterafstotende eienskappe van hierdie basis maak die salf by uitstek geskik vir die behandeling van kontakthuidontsteking. Die genesingswerk word onder die beskermende verskansing voortgesit. Die gevaar van verdere kontak met die prikkelmiddel word verminder, selfs in gevalle waar die pasiënt hom noodgedwonge weer eens daaraan moet blootstel voordat die genesing van die letsels voltooi is. Kliniese proefnemings het aangetoon dat *Cobader*-salf besonder heilsaam in die volgende omstandighede is:

(1) Beroepshuidontsteking in die herstelstadium by pasiënte wat in staat is om na hul werk terug te keer maar wat, sonder *Cobader*, gevaar loop om weer eens in toevallige aanraking te kom met die prikkelmiddel waarop hulle vroeër gereageer het.

(2) Ekseem by huisvrouens—veral dié vrouens wat in 'n sekere mate herstel het, maar verplig word om hul huiswerk te hervat voordat die genesing voltooi is. Die salf moet egter nie aan rou, nat ekseemoppervlaktes gewend word nie, want dit het 'n neiging om enige uitvloei voor te keer. Die veloppervlakte rondom die oë moet ook vermy word.



Weens sy formulering is *Cobader*-salf die verkieslike middel vir die behandeling van toestande soos luiuitslag, intertrigo en droë ontstekingsdrukkoppervlaktes, en vir die opwerp van 'n verskansing teen die prikkeling en afskafing rondom 'n kolostomie, 'n ileostomie-opening, of 'n sinus van 'n operasieplek.

Beskikbaarstelling: *Cobader*-salf bevattende 1 persent hidrokkortison B.P.C. in 'n waterafstotende basis.

Buisies van 10 gram.

PREPARATIONS AND APPLIANCES

BELLERGAL RETARD

Sandoz Limited, announce the introduction of *Bellergal Retard*, a new, long-acting form of their proven *Bellergal*.

Description: *Bellergal Retard* Tablets contain twice the dose of active ingredients present in ordinary *Bellergal*. Thus, one half the number of *Bellergal Retard* Tablets suffices to elicit the same therapeutic effect:

Total l-alkaloids of belladonna leaf

(Bellafoline)	0.2 mg.
Ergotamine tartrate B.P.	0.6 mg.
Phenobarbitone B.P.	40.0 mg.

Bellergal Retard Tablets consist of 3 fractions (yellow, red and green) two of which have a delayed action, and become effective after 4 and 8 hours respectively. The full action is spread out over a period of 10 to 12 hours. The multiple release of active ingredients ensures:

Even sedation throughout the day and night;

Absence of temporary recrudescence of symptoms caused by a 'low' in drug action.



Mode of Action: *Bellergal Retard* blocks the passage of excessive stimuli from psyche to soma in psychomatic (stress and functional) disorders.

Indications: Somatic manifestations of functional and stress disorders, in particular:

Menopausal syndrome; pre-menstrual tension; morning sickness; functional gynaecological conditions;

Effort syndrome (cardiac neurosis and neurocirculatory asthenia);

Gastrointestinal hyper-

secretion and hypermotility (duodenal ulcer);

Psychosomatic skin disorders (neurodermatitis, pruritus, etc.);

Prevention of migraine.

Dosage: 1 *Bellergal Retard* Tablet mornings and evenings. Dosage may be increased to 3 tablets daily, but this should not be exceeded.

Presentation: Bottles of 20, 100 and 250 tablets.

Distributors: Alex. Lipworth Limited, P.O. Box 4461, Johannesburg; P.O. Box 4838, Cape Town; P.O. Box 1988, Durban; P.O. Box 3188, Port Elizabeth.

COBADEx

British Drug Houses have introduced *Cobadex* Ointment which contains hydrocortisone B.P.C. 1% in a water-repellent base.

Indications: The special usefulness of *Cobadex* Ointment lies in the base in which the hydrocortisone is incorporated. The water-repellent properties of this base render the ointment particularly suitable for the treatment of contact dermatitis. The healing continues under the protective barrier. The risks from further contact with the irritant agent are diminished, even when the patient must again be exposed to the irritant before healing of the lesions is complete. Clinical trials have shown *Cobadex* Ointment to be particularly beneficial in the following circumstances:

(1) Occupational dermatitis in the convalescent stage in patients who would be able to return to

work but who without *Cobadex* would run the risk of coming into casual contact with the irritant to which they had reacted.

(2) Eczema in the housewife, especially in those women who have shown some degree of recovery, but who are forced to return to their housework before recovery is complete. The ointment, however, should not be used on raw, weeping surfaces because it tends to hold back any exudate. The area of skin around the eye should be avoided.



Due to its formulation *Cobadex* Ointment is strongly indicated for use in conditions such as napkin rash, intertrigo, dry inflammatory pressure areas, and to form a barrier against the irritation and excoriation appearing around a colostomy, an ileostomy opening, or a sinus from the site of an operation.

Mode of Issue: *Cobadex* Ointment containing hydrocortisone B.P.C. 1%, in a water-repellent base.

Tubes of 10 grammes.

REVIEWS OF BOOKS

CLEFT PALATE SPEECH

Cleft Palate and Speech. By Muriel E. Morley. 1958. (Pp. 264 + Index. With 86 Figs. 27s. 6d.). 4th ed. Edinburgh & London: E. & S. Livingstone Ltd.

The fourth edition of this comprehensive book dealing with all aspects of the cleft palate will be welcomed by all those concerned with the treatment of these patients. Rapid strides have been made in surgery since the first edition of the book in 1945 and, in the words of the author:

'Speech therapy is changing from a hopeless struggle against insuperable odds to achieve speech, to that of post-operative observation and assessment of speech which is developing gradually but surely towards normal.'

This edition provides additional information concerning the incidence, aetiology and inheritance of cleft palate and lip, whilst particular reference is given to the anatomy and physiology of nasopharyngeal closure. Advances in surgical technique, results of operative procedures and findings concerning the development of articulation in children with cleft palates are described.

The 8 chapters deal effectively with all possible aspects of the cleft palate problem and the plastic surgeon, orthodontist and speech therapist will gain a full understanding of their individual and combined responsibilities in dealing with cleft palate patients.

The surgeon will realize the importance of dealing adequately with both the cleft lip and palate and the extreme necessity of avoiding unnecessary

surgical trauma in order to achieve the best possible speech result.

The orthodontist, in turn, will appreciate the value of the use of the new and lighter materials in the manufacture of the obturator.

The speech therapist will gain not only a detailed and excellent account of cleft palate and its problems, but the author has lucidly indicated the anatomy and physiology of the normal speech mechanism, providing therefore a basis for understanding all speech defects.

The author's vast personal experience at New castle-on-Tyne has enabled her to provide excellent chapters on the practical treatment of cleft palate speech, with examples of organization and management of the Follow-Up Clinic.

The book is simply and clearly illustrated and is warmly recommended to all those whose responsibility it may be, in whatever field, in restoring these handicapped patients to their rightful position in society.

PSYCHOTHERAPY BY RECIPROCAL INHIBITION

Psychotherapy by Reciprocal Inhibition. By Joseph Wolpe, M.D. 1958. (Pp. 231 + Index. 32s.). Johannesburg: Witwatersrand University Press.

This is a new and important contribution to the field of psychotherapy. In the first section of his book, Dr. Wolpe gives an account of the basic principles of modern learning theory, which is the foundation stone of his therapeutic methods, and anyone who proposes to employ his techniques

would be well advised to become familiar with Hull's *Principles of Behavior*.

Though Salter in his book *Conditioned Reflex Therapy* dealt with similar techniques, he did not achieve Dr. Wolpe's lucid presentation of therapeutic practice emerging directly from theory. The neurophysiological basis of learning theory will have an appeal to medical men who require an experimental substantiation of theory. This is given in the discussion on the production of animal neuroses, which is fully backed by the results of animal experiments.

Reciprocal inhibition as a therapeutic principle for the treatment of neuroses is framed as follows:

'If a response antagonistic to anxiety can be made to occur in the presence of anxiety-evoking stimuli so that it is accompanied by a complete or partial suppression of the anxiety responses, the bond between these stimuli and the anxiety responses will be weakened.'

A chapter on the etiology of human neuroses completes the first part of this admirable work.

The second section describes the initial interview, and the manner in which the author selects the responses he is going to use in therapy. The most important of these are the assertive responses, the sexual responses and the relaxation responses, but other responses are used, and the list will obviously increase in the future.

The treatment of impotence is a contribution based on the author's original work, and is remarkable for its simplicity.

Chapters on systematic desensitization using relaxation and hypnosis, the treatment of pervasive anxiety by respiratory responses, and the use of special conditioning procedures, are made interesting and instructive by the inclusion of full, illustrative case reports.

A discussion on the treatment of other learned neurotic responses such as hysteria and obsessions completes the section on psychotherapy.

The writer himself points out that the success of any method of psychotherapy can only be measured by its efficacy in bringing about lasting remission of the symptoms which lead the patient to seek advice.

Therapists employing techniques ranging from counselling to psycho-analysis claim that 50% of their cases are apparently cured or much improved. It seems reasonable to think that their results are mainly achieved by the anxiety-inhibiting responses associated with discussing one's problems with someone wise and experienced, and not attributable to measures based on the underlying theory.

Dr. Wolpe's results are impressive. In a series of 210 cases, 90% of patients are apparently cured or much improved with a low average number of interviews (mean=31). Follow-up data on 45 of these cases, in a 2-7 year period, show 44 to have maintained improvement, which is an answer to the usual criticisms levelled by psycho-analysts.

Easily and clearly written, this instructive work should provoke much thought in medical, psychological and psychiatric circles.

CORRESPONDENCE

CLINICAL SPECIALIZATION AND RECOGNITION OF TRAINING IN PATHOLOGY

To the Editor: During a recent visit to Canadian and United States laboratories I was impressed by the fact that a considerable proportion of clinicians wishing to specialize in Surgery, Medicine, Paediatrics or other clinical subjects spend a year in a Department of Pathology.

The benefits of the arrangement were emphasized to me by the clinical registrars who feel that it enables them to obtain an invaluable basic knowledge of the pathogenesis, morbid anatomy and histopathology of disease in their chosen field. On the other hand, the pathologists feel that the year spent in pathology gives clinical registrars an insight into pathology and its problems which is otherwise unobtainable. The year in pathology is also of value to the clinician when he is planning future research programmes.

It is my own opinion, and that of several pathologist colleagues and clinical registrars to whom I have spoken, that it is unfortunate that advantage is not taken of a similar system of training in South Africa.

Perusal of the South African Medical and Dental Council's *Rules Concerning Registration of Specialities* shows, however, that advantage could be taken of such a system in South Africa under existing regulations if the clinicians and pathologists wished to do so.

Under Rule 5 (c) Note (2) it is permissible for an applicant for registration in a clinical speciality

to offer one year's service in Pathology in lieu of general practice. This interpretation of Rule 5 (c) is confirmed by the Acting Registrar of the South African Medical and Dental Council who, at my request, placed the matter before the Council.

The Acting Registrar replies as follows in a letter dated 22 July 1958:

'I am directed by my Committee to forward you a copy of the Council's rules for the registration of specialities, which I append hereto, and invite your attention to the rule relating to experience in lieu of general practice. In terms of this rule it is permissible for an applicant for registration of all specialities to offer one year's service in Pathology as service in lieu of general practice; what you suggest in your letter is consequently already permissible under the rules.'

The scheme holds such advantages for practitioners in clinical medicine and pathology alike that I crave the use of your columns to bring it to the notice of interns, general practitioners and registrars who are contemplating specialization in a clinical subject. Judging by the infrequency with which clinical registrars seek experience in Pathology, it seems likely that they are unaware of the provision which the Medical Council has wisely made for it as an optional part of their training.

J. F. Murray,
Medical Superintendent.

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